ONTARIO PARKS

Springwater

Vegetation Stewardship Plan

Ontario

© 2005 Queen's Printer of Ontario
Printed in Ontario, Canada

Cover Photo: Doug Hamilton

Additional copies of this publication can be obtained from the following address:

Central Zone Ecologist
Ontario Parks
451 Arrowhead Park Road
RR #3
Huntsville, ON
P1H 2J4

Recommended Citation:
Korol, J.B. 2005. Springwater Vegetation Stewardship Plan. A report prepared for the Ontario Parks Central Zone office, Huntsville.

MNR# 51988
(5kP.R., 051115)
ISBN 0-7794-9194-7 (Print)

106-02866/

APPROVAL STATEMENT

I am pleased to provide approval for the **Springwater Vegetation Stewardship Plan**. This plan has been developed to meet the commitment of the Springwater Provincial Park Management Plan (1994) to prepare a vegetation stewardship plan for the park. It has also been developed in accordance with A Class Environmental Assessment for Provincial Parks and Conservation Reserves (2005). This document recommends specific management techniques and provides guidelines for the vegetation issues facing park managers.

The plan will be reviewed periodically to address changing issues or conditions and advances in vegetation stewardship practices.

I extend my sincere thanks to all those who participated in the public consultation process. All comments received were carefully considered during the preparation of this document.

Yours truly,

B. Pfrimmer — Nov 28, 2005

Brian Pfrimmer, Zone Manager
Central Zone, Ontario Parks

Date

TABLE OF CONTENTS

1.0 INTRODUCTION **1**
1.1 Location and Site Description 1
1.2 Policy Framework 3
1.3 Goals of Vegetation Stewardship 4
1.4 Historic Influences on Vegetation Communities 4
2.0 VEGETATION COMMUNITIES AND SUCCESSIONAL PROCESSES **5**
2.1 Conifer Plantations 6
2.2 Old Fields 6
2.3 Native Forest 6
3.0 GENERAL POLICIES **7**
3.1 Conifer Plantations 7
3.2 Old Fields 7
3.3 Native Forest 8
3.4 Hazardous Trees and Windthrows 8
3.5 Herbicide Use 9
3.6 Insect Pests 9
3.7 White-tailed Deer 9
3.8 Fire 10
4.0 VEGETATION STEWARDSHIP UNITS AND PRESCRIPTIONS **10**
4.1 Conifer Plantations 13
4.2 Old Fields 15
4.3 Native Forest 16
5.0 INTRODUCED AND INVASIVE SPECIES **17**
6.0 SIGNIFICANT SPECIES AND SPECIES AT RISK **17**
7.0 RESEARCH AND MONITORING **18**
8.0 SUMMARY OF KEY STEWARDSHIP RECOMMENDATIONS **18**
9.0 SUMMARY OF PUBLIC CONSULTATION **19**
10.0 LITERATURE CITED **19**
Appendix 1. List of 460 Vascular Plant Taxa Found in Springwater Provincial Park **21**

LISIT OF FIGURES

Figure 1. Regional Location of Springwater Provincial Park **2**
Figure 2. Vegetation Stewardship Units (SUs) at Springwater Provincial Park **12**

1.0 INTRODUCTION

1.1 Location and Site Description

Springwater Provincial Park is located 8 km northwest of Barrie along Hwy. 26 in Simcoe County (Figure 1). The study area includes 47 ha of regulated park land and approximately 145 ha of surrounding Crown land that will be added to the park (OMNR 1994) in the near future (M. Stone, Central Zone Assistant Planner, pers. comm., 2004). This Recreation Class park is unique in the Ontario Parks system because it features a wildlife compound which provides a permanent home for non-releasable indigenous mammals and birds of prey. Day use activities include picnicking, wildlife viewing, hiking and cross-country skiing.

The study area is in Ecodistrict 6E-6, which is dominated by a series of 64 m high sand and till islands bordered by shorecliffs, beaches, dunes and boundary terraces (Hanna 1984). The ecodistrict is an area of water-laid clay, silt and sand broken by ridges of loam and sandy loam. Beneath 130 m of overburden, limestones of the Verulam Formation, Simcoe Group form the bedrock of Springwater (Blachut 1977). The park was inundated by Lake Algonquin about 11,000 years ago and an ancient shoreline of Lake Algonquin is present along the eastern half of the park. Glaciolacustrine sands and clays have formed a variety of soils. From west to east through the centre of the study area, the following gradient of soil types is present: Alliston sandy loam, organic, Tioga sandy loam/Vasey sandy loam, Sargent gravelly sandy loam (Hoffman *et al.* 1962).

The vegetation communities in most of the upland areas in the study area have been dramatically altered by human activities. At present, land along the eastern boundary sustains coniferous plantations of Red, Eastern White and Scotch pine and Tamarack. An early successional, native mixedwood forest resulted from periodic thinning and final removal (in 1995) of Jack Pine from a plantation. The eastern half of the north boundary of the study area is dominated by hayfields, which are primarily bordered by Eastern White Cedar and Norway Spruce. The western half of the north boundary is mostly vegetated with coniferous plantations, ranging in age from 20-70 years. In addition to pine, small plantations of Black Spruce and Tamarack are present. There has been intense, historic herbicide and pesticide use in the old nursery plantations. Currently, herbicides are used to control Western Poison-ivy along trails and near picnic areas.

The central and western portions of the study area have native forest and with the exception of the regulated park area, human impacts have been limited. Typical species in upland sites include Eastern White Pine, Red Oak, White Ash and Sugar Maple. Forests in lower areas are dominated by Eastern White Cedar, Balsam Fir and Red Maple.

Figure 1: Regional Location of Springwater Provincial Park

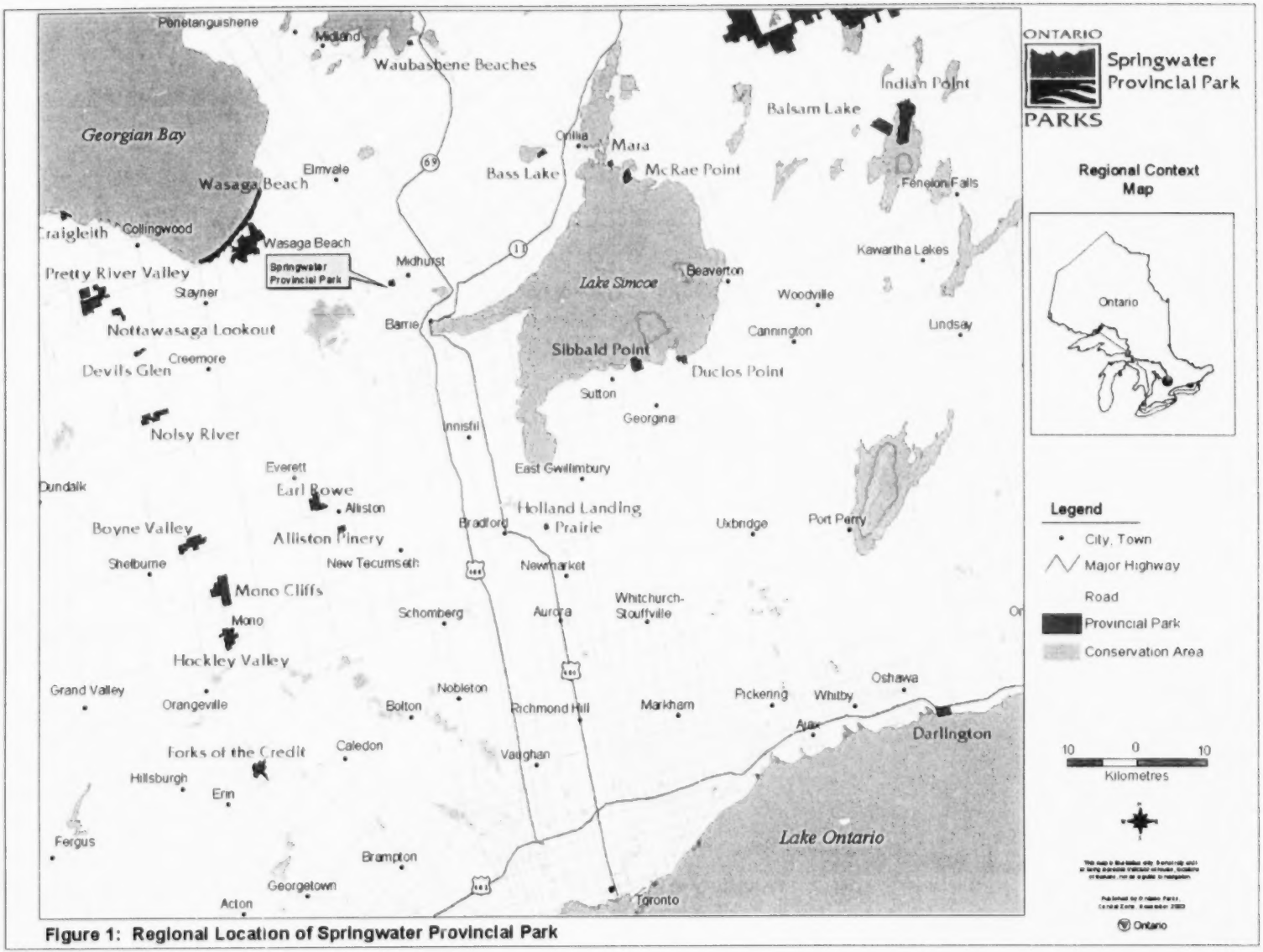

Figure 1: Regional Location of Springwater Provincial Park

The results of a life science inventory at Springwater (Webber 1983) and reconnaissance level work in 2003 indicate that 460 taxa of vascular plants are found in the study area (Appendix 1), none of which are considered Species at Risk by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or the Ontario Ministry of Natural Resources (MNR). The list includes three provincially significant species (i.e., ranked S1, S2 or S3 by the Ontario Natural Heritage Information Centre (NHIC)), none of which have been found since 1983. Just under 28% (128 spp.) of the study area's flora is non-native and 10% (46 spp.) are considered to be invasive. A Tulip Tree was planted near the park office and appears to be thriving. Webber (1983) noted that the American Silverberry in the park was probably also planted.

1.2 Policy Framework

This plan has been developed in accordance with A Class Environmental Assessment for Provincial Parks and Conservation Reserves (MNR 2005) and was screened to a Category B project.

This plan has been developed to fulfill the vegetation resource stewardship policies listed in Section 8.2 of the Springwater Provincial Park Management Plan (OMNR 1994). These policies are:

- to restore and protect indigenous vegetation
- to remove undesirable exotic tree species, such as Scotch Pine, and reforest the areas with indigenous species
- to improve local wildlife habitat
- to control non-native and / or noxious weeds such as Purple Loosestrife
- to continue a plantation management program designed to promote Red Oak and shade tolerant hardwood forest communities
- to remove vegetation which constitutes a safety hazard along trails, especially Jack Pine, which is susceptible to blow down
- to improve aesthetics throughout the park's development zone through implementation of planting and turf management programs
- to protect vegetation from fire and serious insect infestations; chemical sprays will generally not be used to control forest insects unless the forest cover is substantially threatened

The policy "to retain representative examples of coniferous plantations for educational, scientific and interpretive purposes" is no longer considered appropriate and contradicts some of the policies in Section 8.2. The plantations have limited educational or scientific value and Springwater Provincial Park's interpretative program has always been focused on 'self-guided' tours of the wildlife displays and nature trails. There are numerous other examples of coniferous plantations outside of provincial parks throughout Simcoe County, some of which are used as demonstration forests for public education (E. Dertinger, Midhurst MNR District Stewardship Coordinator, pers. comm., 2003).

1.3 Goals of Vegetation Stewardship

The goal of vegetation stewardship in the study area is to ensure the protection and perpetuation of the full diversity of naturally occurring vegetation communities and the processes associated with their development and maintenance. This goal will be achieved through various maintenance and restoration management techniques.

The specific objectives of vegetation stewardship are:

- to conserve, or restore if necessary, viable communities of indigenous plants with an emphasis on provincially significant species and to allow their natural succession
- to restore or enhance natural vegetation features and processes that have been, or are in danger of being, lost or degraded
- to eliminate or reduce the presence of non-native invasive species where feasible
- to provide opportunities for park visitors to learn about and appreciate the park's native vegetation communities and their stewardship in ways that do not threaten their natural values.

To meet these objectives more efficiently, it will sometimes be necessary to adopt an active management approach to counter the legacy of human impacts and facilitate the restoration of natural processes.

1.4 Historic Influences on Vegetation Communities

This section is largely based on Webber (1983) and information provided by K. Reese (Retired Forester and Barrie resident, pers. comm., 2005). There were 23 Huron Indian farming villages in Simcoe County in the early 1600's. Forest clearing for agriculture by the natives and early European settlers continued into the 1800's. Swamps provided the Eastern White Cedar used for making kilometres of rail fences and the shingles used for roofing buildings. Tamaracks, with their straight boles, were always present in the large supporting barn timbers. The upland woods were cut heavily for fuelwood and lumber. By 1875 most of the large trees in upland areas had been logged. The Midhurst Plains were burned annually to promote grass for cattle. Proximity of the Canadian Pacific Railroad resulted in an increased number of fires in the area, which influenced upland vegetation on dry sites. Erosion of topsoil resulted in severe erosion on sandy slopes of the old Lake Algonquin shoreline. Beginning in the early 1920's, plantations of the conifers Jack Pine, Red Pine and Eastern White Pine were established in upland areas of Springwater to control erosion of sandy slopes. These efforts were largely successful in achieving their goal.

The variety of natural and semi-natural vegetation cover types which currently occur at Springwater provide useful clues as to the nature of vegetation prior to

settlement, despite the considerable disturbance of vegetation here in the past 200 years.

Upland areas on the old Lake Algonquin shoreline have "warmer-than-normal" microclimates and it is likely that deciduous forest dominated by deciduous trees and Eastern White Pine once occurred here. It is known historically that Eastern White Pine was logged from the Midhurst area. This may explain why large trees of Eastern White Pine were absent from natural forests at Springwater. The remnant deciduous forest on warm slopes along the rim of the central ravine probably was more extensive before settlement of this area. Most upland regions on the old Lake Algonquin shoreline are now dominated by pine plantations.

Within the current park boundaries, habitats and microclimates "normal" for the region supported a variety of mixed forest communities. Although the order of dominant tree species is largely dependent on site moisture conditions, logging and selective cutting in recent times have resulted in a variety of small, non-homogeneous stands. Much of these forest communities are second-growth; birch and poplar species are prominent in these severely disturbed stands.

A "cooler-than-normal" microclimate occurs in the lowlands of the western region of the park. Here, the perched roots of Eastern White Cedar suggest that substrates of this region were once more wet than they currently appear. Ditching this swamp around 1958 may have resulted in substantial drainage. Despite this alteration, many parts of this conifer swamp complex still occur on saturated substrates.

2.0 VEGETATION COMMUNITIES AND SUCCESSIONAL PROCESSES

The vegetation communities of the regulated portion of the study area were described in detail by Mills (1977) and Webber (1983). The author conducted reconnaissance level vegetation surveys throughout the study area in 2003. The following description of the vegetation communities currently present in the study area is a combination of these results. To facilitate the vegetation stewardship process, communities have been separated into broad habitat classes. Within each class, communities are described using the standardized terminology found in the Ecological Land Classification (ELC) for Southern Ontario (Lee *et al.* 1998). ELC ecosite and vegetation types[1], which are the finest levels of classification, are identified in bold in the text below.

---

[1] **Ecosites** and **vegetation types** are terms used in the ELC. Ecosites are areas with a homogeneous combination of soils and vegetation and are usually mapped at a scale of 1:10,000 or more. Vegetation types are a further subdivision of ecosites, and are based on species composition. The term **community** is used generally to describe vegetation assemblages.

2.1 Conifer Plantations

The **Red Pine Coniferous Plantation Type (CUP3-1)** is one of the study area's most dominant vegetation features. These plantations are found throughout the site, but are especially prevalent along the southeast boundary, with smaller patches in the northwest corner. The Red Pine in the park boundary was planted in 1922. Many of the pines in these plantations are infected with Fomes (*Heterobasidion annosum*) and Armillaria (*Armillaria* spp.) root rots (B. Hutchison, Simcoe County Forest Technician, pers. comm., 2005). A **White Pine Coniferous Plantation Type (CUP3-2)**, which was established in 1924, occurs in the northeast corner of the park and smaller, younger stands are present in the northwest corner of the study area. Stands of the **Scotch Pine Coniferous Plantation Type (CUP3-3)** are found along the northern boundary of the site, but scattered Scotch Pine trees of various ages are found throughout Springwater. In 1920, a **Jack Pine Coniferous Plantation Type (CUP3-4)** was planted in the northeast corner of the park. This stand was periodically thinned over a 30-40 year period prior to the removal of most of the remaining Jack Pine in 1995. The resultant forest is now largely composed of native hardwoods. A mature stand with 1.3 ha of the **Tamarack-European Larch Coniferous Plantation Type (CUP3-5)** is found along the eastern boundary of the study area and a smaller, younger stand is located near Hwy. 26. The only stands with the **White Spruce – European Larch Coniferous Plantation Type (CUP3-8)**, the **Norway Spruce – European Larch Coniferous Plantation Type (CUP3-9)** and **Black Spruce – European Larch Coniferous Plantation Type (CUP3-11)** are located in the northwest portion of the study area.

K. Reese (pers. comm., 2005) noted that that the Springwater plantations were not well managed in the 1960's and 1970's. They carried a very high basal area and as a result little hardwood regeneration has established itself. Because of a lack of management in the past 20 years, many of the trees in plantations, especially along the eastern boundary of the park, are suffering from poor health or vigour.

2.2 Old Fields

The only community in this category is the **Dry – Moist Old Field Meadow Type (CUM1-1)**, which were only found along the north boundary of the study area. These communities are primarily vegetated with non-native, herbaceous vegetation (i.e., hayfields) but Scotch Pine is invading one field in the northeast corner of the park. These borders of individual fields are marked by hedges of native and non-native conifers and hardwoods.

2.3 Native Forest

Native forest on imperfectly drained soils in the central and western portions of the study area are typified by the **Fresh-Moist White Cedar Coniferous Forest**

Type (FOC4-1), the **Fresh-Moist White Cedar-Hemlock Coniferous Forest Type (FOC4-2)** and the **Fresh-Moist White Cedar-Balsam Fir Coniferous Forest Type (FOC4-3)**. These stands were in mid- to late-successional stages.

Mid-successional stands with the **Dry-Fresh Poplar Deciduous Forest Type (FOD3-1)** and the **Dry-Fresh White Birch Deciduous Forest Type (FOD3-2)** were identified south of the fields along the north boundary. A rich, sloping site in the northwest corner of the study area supported the **Dry-Fresh Sugar Maple-Oak Deciduous Forest Type (FOD5-3)**, the **Dry-Fresh Sugar Maple-White Ash Deciduous Forest Type (FOD5-8)** and the **Dry-Fresh Sugar Maple-White Birch Deciduous Forest Type (FOD5-9)**. Approximately 30 short rows of planted Red Oak (**Red Oak Deciduous Plantation Type - CUP 1-8**) are present between this native Sugar Maple stand and the Red Pine plantation to the north.

Well drained soils in the northeast part of the regulated area are characterized by the **Dry-Fresh White Pine-Oak Mixed Forest Type (FOM2-1)**. West of here, the **Dry-Fresh White Birch Mixed Forest Type (FOM5-1)** and the **Dry-Fresh Poplar Mixed Forest Type (FOM5-2)** are present on similar sites, but wetter sites have the **Fresh-Moist Poplar Mixed Forest Type (FOM8-1)** and the **Fresh-Moist White Birch Mixed Forest Type (FOM8-2)**.

3.0 GENERAL POLICIES

3.1 Conifer Plantations

Eventually, all non-native conifers (i.e., Scotch Pine and Norway Spruce) will be removed from the study area. Plantations of Black Spruce and Tamarack in habitats that they would not normally be found (i.e., well-drained uplands) will be converted to more ecologically appropriate forest types. Although it is native to Ontario, Jack Pine does not naturally grow in Ecodistrict 6E-6 and should be removed from the study area. Native conifer plantations of Red Pine, Eastern White Pine and White Spruce established in appropriate habitat will be thinned to the point where their numbers and distribution approximate those in undisturbed climax forests historically found in the ecodistrict. In order to minimize impacts on native vegetation, wildlife and park users, plantation harvest operations should occur between September and February. Many of the recommendations in Section 4.0 are based on the concepts described in OMNR (1996).

3.2 Old Fields

The short-term objective for the old fields is to establish an early successional, mixed forest through a planting program and encouraging natural regeneration from colonization and seed rain. Planting will not occur in rows, but rather in a clustered and randomized pattern, that most closely mimics tree distribution in native forest. Successful establishment of trees will be influenced by factors such as salt spray from vehicles on Highway 26, controlling deer and rodent

browsing and competition with herbaceous vegetation. Tending seedlings using manual, mechanical or chemical methods may be required. Details on these methods are available from OMNR (1995).

Once a young forest is established, it is expected that herbaceous vegetation will decline due to the increased competition for resources. The long-term objective is to establish a late-successional, closed-canopy mixed forest. It is expected that achieving the long-term objective will be enhanced by seed rain from adjacent native trees. The old fields are surrounded by mature hedges with mixtures of native and non-native coniferous and deciduous trees. Because of their current beneficial functions (i.e., native seed rain, site protection, organic inputs, etc.) these hedges should be unmanaged until mature, native forests have been established on the adjacent fields. Once the fields have been successfully converted, non-native trees will be removed from the hedgerows.

3.3 Native Forest

Most of the native forest in the study area is in good condition and will require little management effort. Early successional stands should be allowed to develop naturally into later successional stages, which should simply be maintained and monitored.

3.4 Hazardous Trees and Windthrows

Standing dead trees (i.e., snags) provide critical habitat for a wide variety of wildlife. They also pose a safety hazard in areas frequented by park users and near wildlife displays. Traditionally snags have automatically been considered dangerous regardless of the actual risk they may have posed. Standing dead trees in development zones or along trails or roads will be removed if they pose a risk, but otherwise left in place and designated as wildlife trees. Broken or rotted limbs or crowns may be removed, leaving the trunk for wildlife habitat. Eight species of cavity excavating birds (e.g., woodpeckers, nuthatches) have been found in the study area. They use their cavities as nest and roost sites, which also provide habitat for secondary cavity users (e.g., squirrels, swallows and bluebirds). The presence of cavity dependent species enhances the experience of park users.

Windthrown trees and live branches may be removed where they impede passage along roads or trails, or where the tree falls on day-use areas or wildlife displays. On trails, only that portion of the tree across the trail will be removed and all remaining wood will be left in place. In natural areas, fallen trees and limbs, or portions of, will be left in place as long as they do not pose a public safety risk. Among the many functions of downed woody debris are provision of critical habitat for many species of wildlife, nutrient cycling and erosion control.

3.5 Herbicide Use

The Springwater Provincial Park Management Plan does not address herbicide use, but the policy regarding their application in provincial parks has been outlined by Ontario Parks (1993). Alternatives will be used where feasible (e.g., hand-pulling), but use of herbicides often provides the most effective control of exotic or undesirable species. At present, there is no immediate need to reduce or eliminate invasive exotic species in Springwater (Section 5.0) but small, localized applications (e.g., dabbing of cut stumps) will be used to control selected exotic species (e.g., Black Locust) in the park. If a broader application becomes necessary, serious consideration of potential environmental impacts versus benefits will be given. Only herbicides which biodegrade quickly, have low or no soil activity and for which environmental impacts have been tested and proven to be minimal will be used.

3.6 Insect Pests

It is widely documented that established defoliating insects such as Gypsy Moth (*Lymantria dispar*) and Forest Tent Caterpillar (*Malacosoma disstria*) pose potentially serious threats to forest vegetation. Given the cyclical nature of their populations, monitoring is vital to the prediction and control of outbreaks. However, the potential impacts and ability to control recently discovered wood boring insects such as the Emerald Ash Borer (*Agrilus planipennis*) and Asian Longhorned Beetle (*Anoplophora glabripennis*) are largely unknown. Park staff will need to be educated to recognize the various life stages of these insects and signs of infestations. Park staff will cooperate with MNR staff in monitoring programs when necessary. Decisions regarding widespread control efforts will be made in cooperation with zone and Ontario Parks provincial staff and the Canadian Food Inspection Agency.

3.7 White-tailed Deer

Populations of White-tailed Deer that exceed an ecosystem's carrying capacity can seriously decrease forest understorey species richness, diversity and regeneration. The single largest factor affecting the perpetuation of Rondeau Provincial Park's vegetation communities is over-browsing by White-tailed Deer (OMNR 2001). As a result, deer are culled annually from that park. The number of White-tailed Deer currently using Springwater is estimated as being between three and eight individuals (S. Milne, Springwater Assistant Park Superintendent, pers. comm. 2003). These animals likely undergo local, seasonal migrations and hence their park numbers would vary. The relatively low number deer in the park have probably helped to maintain the overall good condition of the native forest understorey. Unless the number of White-tailed Deer increases significantly, no herd management would be required. However, newly planted hardwood species used in old field restoration (see below) will likely require browsing deterrents to increase the chances of successful regeneration.

3.8 Fire

As mentioned in Section 1.4, fire has historically influenced the development of vegetation communities at Springwater. The current policy of fire suppression has undoubtedly degraded some habitats in the study area. Periodic fire favours the maintenance of diverse communities of native species. They also reduce fuel loads, which decreases the likelihood of large or intense fires that are difficult to control. From time to time, it may be necessary to rejuvenate selected habitats through the use of prescribed burns and active fire management. Low intensity surface fires provide a competitive advantage for oaks, encourage oak regeneration and discourage undesired competition from other species (OMNR 2000). Any burning conducted within the park will follow the Fire Management Policy for Provincial Parks and Conservation Reserves (2004), have an approved prescribed burning plan and be done by trained staff, while ensuring the safety of park visitors and property.

4.0 VEGETATION STEWARDSHIP UNITS AND PRESCRIPTIONS

Natural (e.g., streams) and artificial (e.g., roads) boundaries were used to divide the study area into 46 vegetation stewardship units (SUs), which are shown in Figure 2. The structure, composition[2] and successional stage of the vegetation in each SU are relatively homogeneous, which will facilitate management activities. The following summarizes the characteristics and stewardship prescriptions for each SU. Prior to implementing individual prescriptions, it will be necessary to conduct detailed field surveys to 1) document the presence of significant and invasive species and, if necessary, mitigate impacts; 2) prepare detailed sylvicultural prescriptions (e.g., marking individual trees, assess blowdown potential); and 3) prepare detailed planting plans for old field SUs (e.g., identify suitable microsites, determine planting density). Detailed field surveys will be required prior to each harvest and planting cycle.

Implementing prescriptions in similar SUs should be conducted in a phased approach. This will allow assessment and, if necessary, modification of future prescriptions (i.e., adaptive management) and spreading expenses over a period of years. For example, if SU F10 is planted at a certain seedling density, with a subset of seedlings protected from browsing, the success of the planting in this SU can be monitored and used as a model for subsequent plantings in other old field SUs. Another benefit of the phased approach is age heterogeneity of the vegetation, which contributes to increased biodiversity.

It is important to clearly communicate the objectives of this plan to those who will be writing and implementing the stewardship prescriptions. The goals of this plan are to improve Springwater's biodiversity by re-establishing natural forest

[2] Ce = Eastern White Cedar; L = Tamarack; Or = Red Oak; Pb = Balsam Poplar; Pj = Jack Pine; Pr = Red Pine; Ps = Scotch Pine; Pw = Eastern White Pine; Sb = Black Spruce; Sn = Norway Spruce; Sw = White Spruce

structure and composition using native species. Maximizing profit from tree harvest and 'improving' forest health are not primary considerations. Tree markers must have a comprehensive knowledge and understanding of forest ecology to ensure impacts to stand structural diversity and established native hardwoods are minimized during harvesting operations.

Signs erected during and after stewardship activities can be used to inform park users as to the purpose and benefits of harvest and planting operations.

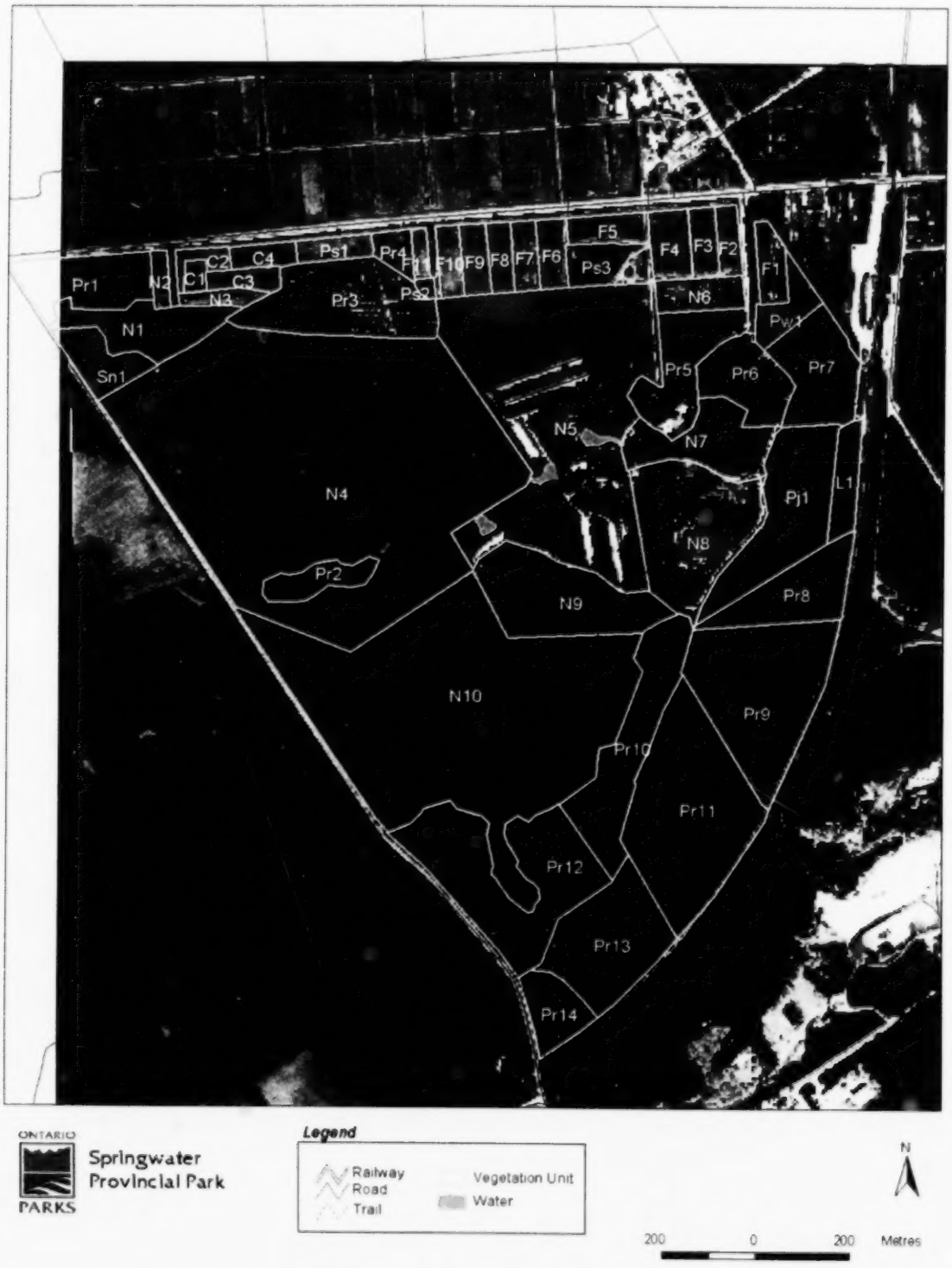

Figure 2. Vegetation Stewardship Units (SUs) at Springwater Provincial Park.

4.1 Conifer Plantations

SU	ELC Units	Composition	Area (ha)	Past Stewardship	Recommendation
L1	CUP3-5	mature Tamarack; native understorey regeneration good	1.3	none	initial removal of 30% of L stems with subsequent 5-7 year thinning cycle until all are gone
Pj1	CUP3-4	advanced native hardwood regeneration in good condition; scattered Pj	5.3	planted to Pj in 1920; periodic thinning over a 30-40 period; initial unsuccessful application of traditional Pr thinning prescriptions eventually changed to Pj prescriptions; most Pj removed in the mid 1990s	except for felling of remnant Pj, no management required
Pr1	CUP3-1; CUP1-8	mostly mature Pr, but with small plantation of Or; native understorey regeneration moderate	3.0	some thinning (1997/98)	initial removal of 30% of Pr stems with subsequent 5-7 year thinning cycle until 5% of stems remain; thinning of Or if deemed beneficial
Pr2	CUP3-1	mature Pr; native understorey poor, but better near edges of SU	1.3	none	initial removal of 30% of Pr stems with 8-10 year thinning cycle to follow until 5% of stems remain; encourage colonization by native species from N4
Pr3	CUP3-1	mature Pr; native understorey poor / good in E / W end of SU, respectively	5.4	some thinning (1997/98)	initial removal of 30% of Pr stems with 8-10 year thinning cycle in E end and 5-7 year cycle in W end, until 5% of stems remain
Pr4	CUP3-1	mature Pr with sparse Ps; native hardwood regeneration good		?	immediate removal of Ps; initial removal of 30% of Pr stems with subsequent 5-7 year thinning cycle until 5% of stems remain
Pr5	CUP3-1	mature Pr; advanced native hardwood regeneration	3.3	last thinning 1994/95	selective felling of 30% Pr with 8-10 year thinning cycle until 5% of current number of stems remain
Pr6	CUP3-1	mature Pr; advanced native hardwood regeneration	2.6	last thinning 1994/95	selective felling of 30% Pr with 8-10 year thinning cycle until 5% of current number of stems remain

Figure 2. Vegetation Stewardship Units (SUs) at Springwater Provincial Park.

4.1 Conifer Plantations

SU	ELC Units	Composition	Area (ha)	Past Stewardship	Recommendation
L1	CUP3-5	mature Tamarack; native understorey regeneration good	1.3	none	initial removal of 30% of L stems with subsequent 5-7 year thinning cycle until all are gone
Pj1	CUP3-4	advanced native hardwood regeneration in good condition; scattered Pj	5.3	planted to Pj in 1920; periodic thinning over a 30-40 period; initial unsuccessful application of traditional Pr thinning prescriptions eventually changed to Pj prescriptions; most Pj removed in the mid 1990s	except for felling of remnant Pj, no management required
Pr1	CUP3-1; CUP1-8	mostly mature Pr, but with small plantation of Or; native understorey regeneration moderate	3.0	some thinning (1997/98)	initial removal of 30% of Pr stems with subsequent 5-7 year thinning cycle until 5% of stems remain; thinning of Or if deemed beneficial
Pr2	CUP3-1	mature Pr; native understorey poor, but better near edges of SU	1.3	none	initial removal of 30% of Pr stems with 8-10 year thinning cycle to follow until 5% of stems remain; encourage colonization by native species from N4
Pr3	CUP3-1	mature Pr; native understorey poor / good in E / W end of SU, respectively	5.4	some thinning (1997/98)	initial removal of 30% of Pr stems with 8-10 year thinning cycle in E end and 5-7 year cycle in W end, until 5% of stems remain
Pr4	CUP3-1	mature Pr with sparse Ps; native hardwood regeneration good		?	immediate removal of Ps; initial removal of 30% of Pr stems with subsequent 5-7 year thinning cycle until 5% of stems remain
Pr5	CUP3-1	mature Pr; advanced native hardwood regeneration	3.3	last thinning 1994/95	selective felling of 30% Pr with 8-10 year thinning cycle until 5% of current number of stems remain
Pr6	CUP3-1	mature Pr; advanced native hardwood regeneration	2.6	last thinning 1994/95	selective felling of 30% Pr with 8-10 year thinning cycle until 5% of current number of stems remain

SU	ELC Units	Composition	Area (ha)	Past Stewardship	Recommendation
Pr7	CUP3-1 (25%), CUP3-2 (65%) and CUP3-3 (10%)	mature Pr, Pw and Ps; native understorey regeneration good	3.4	last thinning mid-1980's or prior to this	immediate removal of Ps; initial removal of 50% of Pr stems with subsequent 5-7 year thinning cycle until 5% of stems remain; initial removal of 30% of Pr stems with subsequent removal of remaining 50% of stems in 5-7 years so only 30% of current number of stems remain
Pr8	CUP3-1	mature Pr; native understorey regeneration poor	3.2	last thinning mid-1980's or prior to this	initial removal of 30% of Pr stems with subsequent 8-10 year thinning cycle until 5% of stems remain
Pr9	CUP3-1	mature Pr; native understorey regeneration good	7.9	last thinning mid-1980's or prior to this	initial removal of 30% of Pr stems with subsequent 5-7 year thinning cycle until 5% of stems remain
Pr10	CUP3-1 (40%), CUP3-2 (10%) and CUP3-4 (50%	mature Pr with Pw and Pj; native understorey regeneration good	4.9	last thinning mid-1980's or prior to this	initial removal of 30% of Pr stems with subsequent 5-7 year thinning cycle until 5% of stems remain; Pw unmanaged; initial removal of 50% of Pj stems with subsequent removal of remaining Pj in 5-7 years
Pr11	CUP3-1	mature Pr; native understorey regeneration good	9.2	last thinning mid-1980's or prior to this	initial removal of 30% of Pr stems with subsequent 5-7 year thinning cycle until 5% of stems remain
Pr12	CUP3-1	mature Pr; native understorey regeneration good	8.0	last thinning mid-1980's or prior to this	initial removal of 30% of Pr stems with subsequent 5-7 year thinning cycle until 5% of stems remain
Pr13	CUP3-1	mature Pr; native understorey regeneration good	5.1	last thinning mid-1980's or prior to this	initial removal of 30% of Pr stems with subsequent 5-7 year thinning cycle until 5% of stems remain
Pr14	CUP3-1	mature Pr, with snags; native understorey regeneration good	1.7	last thinning mid-1980's or prior to this	due to high local mortality, single harvest cycle with removal of 30% of Pr stems
Ps1	CUP3-3	young Ps, with native conifer regeneration and Ce hedge		?	initial felling of 40% of Ps stems with subsequent 3-5 year thinning cycle until all stems are gone; immediate felling of all Sb; initial thinning of Sw; planting of Pw and Or
Ps2	CUP3-3	mature Ps; moderate regeneration of Sw, B and some Or		?	immediate removal of 50% of Ps; removal of remaining Ps in two cycles, 5 years apart
Ps3	CUP3-3; CUP3-1	mature Ps, Sw, Or, Pr; native understorey regeneration good		some thinning 1997/98	immediate removal of all Ps and 95% of Pr

SU	ELC Units	Composition	Area (ha)	Past Stewardship	Recommendation
Pw1	CUP3-2	mature Pw; native understorey regeneration good	1.2	some thinning mid-1980's or prior to this	removal of 10-20% of Pw stems; if Pw regeneration is impacting native hardwood regeneration light burning may be considered
Sn1	CUP3-9	Sn; no native understorey	1.6	none; some trenching	immediate thinning of stand to decrease current crown closure by 50%; plant tolerant hardwoods if no spontaneous regeneration of native species occurs within 5 years
C1	CUP3-2	advanced Pw regeneration		none	immediate removal of 50% of Pw stems; future removal of 30% of Pw; planting of Or
C2	CUP3-3	young Ps		none	immediate removal of all Ps; planting and tending of Pw, Or
C3	CUP3-8	young Sw		none	immediate removal of 80-90% of Sw; planting and tending of Pw and Or
C4	CUP3-1, CUP3-2 CUP3-5, CUP3-8 CUP3-11	small patches of Sw, Pw, Pr, Sb and L		none	immediate removal of 80% of Sw, 70% of Pw, 90% of Pr and all Sb and L; planting of Or

4.2 Old Fields

SU	ELC Units	Composition	Area (ha)	Past Stewardship	Proposed
F1	CUM1-1	native and non-native herbs; limited Pb regeneration; young Ps; Sn hedges; several rows of mature Ps on east side	1.0	old field	immediate removal of Ps; tending of regenerating Pb; planting and tending of Pw, Or
F2	CUM1-1	native and non-native herbs; Sn and Ce hedges; 1.5 m Ce hedge along Hwy. 26	0.7	old hayfield	planting and tending of Pw, Or
F3	CUM1-1	non-native herbs; Sn and Ce hedges; 1.5 m Ce hedge along Hwy. 26	0.8	old hayfield	planting and tending of Pw, Or
F4	CUM1-1	non-native herbs; Sn, Ce and native hardwood hedges; 1.5 m Ce hedge along Hwy. 26	1.3	old hayfield	planting and tending of Pw, Or
F5	CUM1-1	non-native herbs; Ce and native hardwood hedges; 4 m Ce hedge along Hwy. 26	1.0	old hayfield	planting and tending of Pw, Or
F6	CUM1-1	non-native herbs; Ce, Sn and native mixedwood hedges; 5 m Ce, Or, Cb hedge along Hwy. 26	0.9	old hayfield	planting and tending of Pw, Or
F7	CUM1-1	non-native herbs; Ce, Sn and native mixedwood hedges; 5 m Ce hedge along Hwy. 26	0.8	old hayfield	planting and tending of Pw, Or

SU	ELC Units	Composition	Area (ha)	Past Stewardship	Proposed
F8	CUM1-1	non-native herbs; Ce, Sn and native conifer hedges; 5 m Ce hedge along Hwy. 26	0.8	old hayfield	planting and tending of Pw, Or
F9	CUM1-1	non-native herbs; Ce, Sn and native mixedwood hedges; 5 m Ce hedge along Hwy. 26	0.9	old hayfield	planting and tending of Pw, Or
F10	CUM1-1	native and non-native herbs; Ce, Sw, Or and Sn hedges; 5 m Ce hedge along Hwy. 26	0.8	old hayfield	planting and tending of Pw, Or
F11	CUM1-1	native and non-native herbs; Ce, Sw, Or and Sn hedges; 5 m Ce hedge along Hwy. 26	0.4	old hayfield	planting and tending of Pw, Or

4.3 Native Forest

SU	ELC Units	Composition	Area (ha)	Past Stewardship	Proposed
N1	FOD5-3; FOD5-8; FOD5-9; CUP1-8	mature Aw, Or, Mh and Ms; small Or plantation	2.9	none	no management required
N2	CUM1-1	regenerating native trees, shrubs and herbs; sparse Sn	0.4	old field	except for removal of Sn, no management required
N3	FOM5-2	Sw and Sb with young Pt, Pg and Ms	0.6	none	except for removal of Bs, no management required
N4	FOM5-1; FOM5-2; FOM8-1; FOM8-2	B, Pw, Aw – declining Pg and Bw	39.1	none	no management required
N5	FOD3-2, FOD3-1, FOM5-1, FOM5-2	mature mixed forest with Aw, Or, Bw, Ps; B and Sw in tall shrub layer	20.4	none	except for removal of Ps, no management required
N6	FOM2-1	Or, Sw, Ps, Pw	1.3	Pj and Ps removed in eastern half in 1997/98	immediate removal of all remaining Ps
N7	FOM2-1	Or, Pw, Ms	3.3	Pj removed in 1997/98	no management required
N8	FOM	advance regeneration of native hardwood and conifers; scattered Pj and Ps	6.4	most Pj removed when it was 73 years old (1997/98)	removal of all remaining Ps and Pj
N9	FOC4-3	mature native conifer; Bw declining	5.3	none	no management required
N10	FOC4-1; FOC4-3 most common lowland types; FOC4-2 in better drained sites	lowlands primarily Ce, B, Bw, Sw; better drained sites have Aw, Bw, Pg and Bd	27.3	none	no management required

5.0 INTRODUCED AND INVASIVE SPECIES

Of the 460 taxa of vascular plants known to occur at Springwater Provincial Park, 128 (28%) are not native to Ontario and 46 (10%) are invasive (Appendix 1). Invasive species have the potential to move into areas and displace native species, which reduces biodiversity and impacts normal ecological processes. Several invasive species have been intentionally introduced into the study area, primarily for their aesthetic and erosion control values.

For exotic species that have not yet become widespread in the park (e.g., Black Locust) park staff should remove all individuals. Complete removal of species that are more widespread or have higher reproductive potential may not be feasible. However, by implementing and maintaining appropriate vegetation stewardship activities (e.g., conversion of plantations and old fields to native forest) habitat changes will likely favour native species.

6.0 SIGNIFICANT SPECIES AND SPECIES AT RISK

Three provincially rare vascular plant species have been found in the study area but none of them are currently classified at risk by the MNR or COSEWIC. Intensive surveys to determine their current locations and numbers should be conducted near the peak of their respective flowering times or prior to stewardship activities. Regardless of their success, search efforts should be registered with the NHIC. If rediscovered, their locations should be documented with a Global Positioning System unit in the field.

Giant Pinedrops (S2) was found in SU Pw-1 in 1977 but has apparently never been relocated (G. Allen, Midhurst MNR District Ecologist, pers. comm., 2003). This species was unsuccessfully searched for on 12 August 03. An intensive search of SU Pw-1 should be conducted in July or August, but this species is reputed to be ephemeral.

In 1983 Finely-pilose Evening-primrose (S2) was identified in a rubbish heap in the 'central' part of the park (Webber 1983). This species blooms in June and July. Also in 1983, Houghton's Umbrella-sedge (S3?) was reported from a flower bed along the east side of the main entrance road, north of the park gate (SU F1). Webber (1983) has suggested this species may have been planted here. In 1992, M.J. Oldham found this species just to the east of the study area along the railroad tracks. This relatively conspicuous sedge fruits in the summer months.

7.0 RESEARCH AND MONITORING

Research improves our knowledge of, and ability to manage, the park's resources. Monitoring is crucial to evaluating our management successes and failures and identifying effective alternatives. The proposed stewardship activities at Springwater provide significant opportunities for scientific research and monitoring. Because Ontario Parks has limited funding to support these activities, other agencies and institutions should be made aware of the potential prospects at Springwater.

Harvesting and removal of native and non-native conifers from plantations and mixedwood sites have the potential to adversely affect the park ecosystem. Extensive blow down of both desirable and undesirable residual trees is possible if harvest levels exceed critical thresholds. Site disturbance and increased light levels resulting from tree removal and creation of canopy gaps may stimulate weed or undesirable shrub growth (e.g., Wild Red Raspberry). The results of monitoring of the responses of the earliest phases of conifer plantation management should be used to modify subsequent management, if necessary.

Periodic surveys of selected plantations and native forests will be required to determine if Scotch Pines are re-seeding after their removal. Should any other Black Locust trees be found at Springwater, they should be removed and their stumps treated with herbicide. Occasional monitoring of treated stumps will be required for a few years until the root mass has been completely killed.

Old field management will require monitoring of establishment, salt damage and depredation of planted seedlings by White-tailed Deer and rodents. If monitoring reveals that spontaneous regeneration of native species under newly opened forest canopies or adjacent to old field hedgerows is inadequate, supplemental plantings should be considered.

8.0 SUMMARY OF KEY STEWARDSHIP RECOMMENDATIONS

Through a phased approach, over the next several decades, vegetation stewardship at Springwater Provincial Park should strive to:

- eliminate 95% of the Red Pine currently in plantations
- reduce the current number of Eastern White Pine in plantations by 70%
- remove all Scotch Pine and Norway Spruce in the park
- establish a mix of Eastern White Pine and Red Oak trees in the old fields
- convert the old fields to a forested community with a variety of native woody and herbaceous species
- remove all Black Spruce and Tamarack in upland plantations
- find and monitor rare species
- monitor non-native, invasive and undesirable plant species

9.0 SUMMARY OF PUBLIC CONSULTATION

As directed by the Class Environmental Assessment for Provincial Parks and Conservation Reserves (MNR 2005), public consultation was an important part of the vegetation stewardship planning process. Once the draft plan was completed stakeholders and local residents were notified by mail. A paid advertisement appeared in the local newspaper and the plan was posted on the Ontario Parks website in November 2004. Paper copies of the plan were sent to those who requested it. Following the release of the notices and draft document there was a 45-day review and comment period. All public comments were carefully considered in the preparation of the final vegetation stewardship plan. The planning process was completed with release of the approved Springwater Vegetation Stewardship plan in January 2005. Copies of the document were distributed to individuals that participated in the planning process. This stewardship plan will be reviewed or amended as required.

10.0 LITERATURE CITED

Blachut, S. 1977. Earth Science Checklist: Springwater Provincial Park. Ontario Ministry of Natural Resources, Division of Parks, Queen's Park.

Hanna, R. 1984. Life Science Areas of Natural and Scientific Interest in Site District 6E-6. A review and assessment of Significant Natural Areas in Site District 6E-6. Ontario Ministry of Natural Resources, Parks and Recreation Areas Section, Central Region, Richmond Hill.

Hoffman, D.W., R.E. Wicklund and N.R. Richards. 1962. Soil Survey of Simcoe County. Report No. 29 of the Ontario Soil Survey, Research Branch, Canada Department of Agriculture and the Ontario Agricultural College.

Lee, H.T., W.D. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig and S. McMurray. 1998. Ecological Land Classification for Southern Ontario: First Approximation and Its Application. OMNR, Southcentral Science Section, Science Development and Transfer Branch. SCSS Field Guide FG-02.

Mills, A. 1977. Wildlife and plants of Springwater – A survey of the summer birds and a preliminary list of the mammals and plants occurring within Springwater Provincial Park, Midhurst, Ontario, June 13 through July 12, 1977. Unpublished report prepared for the Ontario Ministry of Natural Resources.

MNR. 2005. A Class Environmental Assessment for Provincial Parks and Conservation Reserves. Ontario Ministry of Natural Resources Environmental Assessment Report Series.

OMNR. 1994. Springwater Provincial Park Management Plan. Ontario Ministry of Natural Resources.

OMNR. 1995. Room to Grow: Controlling the Competition. OMNR Extension Note, produced by the Land Owner Resource Centre and the Ontario Ministry of Natural Resources.

OMNR. 1996. Managing Regeneration in Conifer Plantations to Restore a Mixed, Hardwood Forest. OMNR Extension Note, produced by the Land Owner Resource Centre and the Ontario Ministry of Natural Resources.

OMNR. 2000. A sylvicultural guide to managing southern Ontario forests, Version 1.1. Ont. Min. Nat. Resour. Queen's Printer for Ontario. Toronto. 648 pp.

OMNR. 2001. Rondeau Vegetation Management Plan. Ontario Ministry of Natural Resources.

Ontario Parks. 1993. Use of Pesticides and Herbicides in Provincial Parks, Policy No. PM 2.16. Park Operations and Development Section.

Webber, J.M. 1983. A reconnaissance biological inventory of Springwater Provincial Park. Unpublished report prepared for the Parks and Recreation Section, Ontario Ministry of Natural Resources, Central Region, Richmond Hill.

Appendix 1. List of 460 Vascular Plant Taxa Found in Springwater Provincial Park

* = non-native taxa
Inv. = invasive taxa; priorities for control range from high (1) to low (4)
1977 = reconnaissance inventory by A. Mills
1983 = detailed inventory by J. Webber
2003 = reconnaissance inventory by B. Korol

Family	Scientific Name	Authority	S-Rank	Common Name	Inv.	1977	1983	2003
Lycopodiaceae	*Diphasiastrum complanatum*	(L.) Holub.	S5	Northern Running-pine			X	
Lycopodiaceae	*Huperzia lucidula*	(Michaux) Trevisan	S5	Shining Fir-moss			X	
Lycopodiaceae	*Lycopodium clavatum*	L.	S5	Running Club-moss			X	
Lycopodiaceae	*Lycopodium obscurum*	L.	S4	Ground-pine			X	
Equisetaceae	*Equisetum arvense*	L.	S5	Field Horsetail			X	X
Equisetaceae	*Equisetum pratense*	Ehrh.	S5	Meadow Horsetail			X	
Equisetaceae	*Equisetum scirpoides*	Michx.	S5	Dwarf Scouring-rush			X	
Equisetaceae	*Equisetum sylvaticum*	L.	S5	Woodland Horsetail			X	
Ophioglossaceae	*Botrychium virginianum*	(L.) Sw.	S5	Rattlesnake Fern			X	
Osmundaceae	*Osmunda cinnamomea*	L.	S5	Cinnamon Fern			X	X
Osmundaceae	*Osmunda claytoniana*	L.	S5	Interrupted Fern				X
Osmundaceae	*Osmunda regalis*	L.	S5	Royal Fern			X	X
Pteridaceae	*Adiantum pedatum*	L.	S5	Northern Maidenhair Fern			X	
Dennstaedtiaceae	*Pteridium aquilinum*	(L.) Kuhn	S5	Bracken Fern			X	X
Thelypteridaceae	*Thelypteris palustris*	Schott	S5	Marsh Fern			X	
Dryopteridaceae	*Athyrium filix-femina var. angustum*		S5	Northern Lady Fern			X	X
Dryopteridaceae	*Cystopteris bulbifera*	(L.) Bernh.	S5	Bulblet Fern			X	X
Dryopteridaceae	*Dryopteris carthusiana*	(Vill.) H.P. Fuchs	S5	Spinulose Wood Fern			X	X
Dryopteridaceae	*Dryopteris clintoniana*	(D.C. Eat.) Dowell	S4	Clinton's Wood Fern			X	
Dryopteridaceae	*Dryopteris cristata*	(L.) Gray	S5	Crested Wood Fern			X	X
Dryopteridaceae	*Dryopteris intermedia*	(Muhl. ex Willd.) Gray	S5	Evergreen Wood Fern			X	
Dryopteridaceae	*Dryopteris marginalis*	(L.) Gray	S5	Marginal Wood Fern			X	X
Dryopteridaceae	*Gymnocarpium dryopteris*	(L.) Newman	S5	Oak Fern			X	X
Dryopteridaceae	*Matteuccia struthiopteris*	(L.) Todaro	S5	Ostrich Fern			X	X
Dryopteridaceae	*Onoclea sensibilis*	L.	S5	Sensitive Fern			X	X
Pinaceae	*Abies balsamea*	(L.) P. Mill.	S5	Balsam Fir			X	X
Pinaceae	*Larix decidua**	P. Mill.	SE2	European Larch*			X	
Pinaceae	*Larix laricina*	(Du Roi) K. Koch	S5	Tamarack			X	X
Pinaceae	*Picea abies**	(L.) Karst.	SE3	Norway Spruce*			X	X
Pinaceae	*Picea glauca*	(Moench) Voss	S5	White Spruce			X	X

Appendix 1. List of 460 Vascular Plant Taxa Found in Springwater Provincial Park

* = non-native taxa
Inv. = invasive taxa; priorities for control range from high (1) to low (4)
1977 = reconnaissance inventory by A. Mills
1983 = detailed inventory by J. Webber
2003 = reconnaissance inventory by B. Korol

Family	Scientific Name	Authority	S-Rank	Common Name	Inv.	1977	1983	2003
Lycopodiaceae	*Diphasiastrum complanatum*	(L.) Holub.	S5	Northern Running-pine			X	
Lycopodiaceae	*Huperzia lucidula*	(Michaux) Trevisan	S5	Shining Fir-moss			X	
Lycopodiaceae	*Lycopodium clavatum*	L.	S5	Running Club-moss			X	
Lycopodiaceae	*Lycopodium obscurum*	L.	S4	Ground-pine			X	
Equisetaceae	*Equisetum arvense*	L.	S5	Field Horsetail			X	X
Equisetaceae	*Equisetum pratense*	Ehrh.	S5	Meadow Horsetail			X	
Equisetaceae	*Equisetum scirpoides*	Michx.	S5	Dwarf Scouring-rush			X	
Equisetaceae	*Equisetum sylvaticum*	L.	S5	Woodland Horsetail			X	
Ophioglossaceae	*Botrychium virginianum*	(L.) Sw.	S5	Rattlesnake Fern			X	
Osmundaceae	*Osmunda cinnamomea*	L.	S5	Cinnamon Fern			X	X
Osmundaceae	*Osmunda claytoniana*	L.	S5	Interrupted Fern				X
Osmundaceae	*Osmunda regalis*	L.	S5	Royal Fern			X	X
Pteridaceae	*Adiantum pedatum*	L.	S5	Northern Maidenhair Fern			X	
Dennstaedtiaceae	*Pteridium aquilinum*	(L.) Kuhn	S5	Bracken Fern			X	X
Thelypteridaceae	*Thelypteris palustris*	Schott	S5	Marsh Fern			X	
Dryopteridaceae	*Athyrium filix-femina var. angustum*		S5	Northern Lady Fern			X	X
Dryopteridaceae	*Cystopteris bulbifera*	(L.) Bernh.	S5	Bulblet Fern			X	X
Dryopteridaceae	*Dryopteris carthusiana*	(Vill.) H.P. Fuchs	S5	Spinulose Wood Fern			X	X
Dryopteridaceae	*Dryopteris clintoniana*	(D.C. Eat.) Dowell	S4	Clinton's Wood Fern			X	
Dryopteridaceae	*Dryopteris cristata*	(L.) Gray	S5	Crested Wood Fern			X	X
Dryopteridaceae	*Dryopteris intermedia*	(Muhl. ex Willd.) Gray	S5	Evergreen Wood Fern			X	
Dryopteridaceae	*Dryopteris marginalis*	(L.) Gray	S5	Marginal Wood Fern			X	X
Dryopteridaceae	*Gymnocarpium dryopteris*	(L.) Newman	S5	Oak Fern			X	X
Dryopteridaceae	*Matteuccia struthiopteris*	(L.) Todaro	S5	Ostrich Fern			X	X
Dryopteridaceae	*Onoclea sensibilis*	L.	S5	Sensitive Fern			X	X
Pinaceae	*Abies balsamea*	(L.) P. Mill.	S5	Balsam Fir			X	X
Pinaceae	*Larix decidua**	P. Mill.	SE2	European Larch*			X	
Pinaceae	*Larix laricina*	(Du Roi) K. Koch	S5	Tamarack			X	X
Pinaceae	*Picea abies**	(L.) Karst.	SE3	Norway Spruce*			X	X
Pinaceae	*Picea glauca*	(Moench) Voss	S5	White Spruce			X	X

Pinaceae	*Picea mariana*	(P. Mill.) B.S.P.	**S5**	Black Spruce			X	X
Pinaceae	*Picea pungens**	Engelm.	**SE1**	Blue Spruce*			X	
Pinaceae	*Pinus banksiana*	Lamb.	**S5**	Jack Pine			X	X
Pinaceae	*Pinus mugo**	Turra	**SE1**	Mugo Pine*			X	
Pinaceae	*Pinus resinosa*	Soland.	**S5**	Red Pine			X	X
Pinaceae	*Pinus strobus*	L.	**S5**	Eastern White Pine			X	X
Pinaceae	*Pinus sylvestris**	L.	**SE5**	Scotch Pine*	**2**		X	X
Pinaceae	*Tsuga canadensis*	(L.) Carr.	**S5**	Eastern Hemlock			X	X
Cupressaceae	*Juniperus communis var. depressa*	Pursh	**S5**	Dwarf Juniper			X	X
Cupressaceae	*Juniperus virginiana*	L.	**S5**	Eastern Red Cedar			X	
Cupressaceae	*Thuja occidentalis*	L.	**S5**	Eastern White Cedar			X	X
Taxaceae	*Taxus canadensis*	Marsh.	**S5**	Canadian Yew			X	X
Magnoliaceae	*Liriodendron tulipifera*	L.	**S4**	Tulip Tree			X	X
Aristolochiaceae	*Asarum canadense*	L.	**S5**	Wild Ginger		X	X	X
Ranunculaceae	*Actaea pachypoda*	Ell.	**S5**	White Baneberry		X	X	X
Ranunculaceae	*Actaea rubra*	(Ait.) Willd.	**S5**	Red Baneberry		X	X	X
Ranunculaceae	*Anemone canadensis*	L.	**S5**	Canada Anemone			X	
Ranunculaceae	*Anemone cylindrica*	Gray	**S4**	Long-fruited Anemone			X	
Ranunculaceae	*Anemone virginiana*	L.	**S5**	Virginia Anemone			X	
Ranunculaceae	*Aquilegia canadensis*	L.	**S5**	Wild Columbine		X	X	X
Ranunculaceae	*Caltha palustris*	L.	**S5**	Marsh-marigold		X	X	
Ranunculaceae	*Clematis virginiana*	L.	**S5**	Virgin's-bower		X	X	
Ranunculaceae	*Coptis trifolia*	(L.) Salisb.	**S5**	Goldthread			X	
Ranunculaceae	*Ranunculus abortivus*	L.	**S5**	Kidney-leaf Buttercup			X	
Ranunculaceae	*Ranunculus acris**	L.	**SE5**	Tall Buttercup*		X	X	
Ranunculaceae	*Ranunculus pensylvanicus*	L. f.	**S5**	Bristly Buttercup			X	
Ranunculaceae	*Ranunculus recurvatus*	Poir.	**S5**	Hooked Buttercup			X	
Ranunculaceae	*Ranunculus repens**	L.	**SE5**	Creeping Buttercup*	**3**		X	
Ranunculaceae	*Ranunculus sceleratus*	L.	**S5**	Cursed Buttercup			X	
Ranunculaceae	*Thalictrum dasycarpum*	Fisch. & Ave-Lall.	**S4?**	Purple Meadow-rue				X
Ranunculaceae	*Thalictrum dioicum*	L.	**S5**	Early Meadow-rue			X	
Ranunculaceae	*Thalictrum pubescens*	Pursh	**S5**	Tall Meadow-rue			X	
Berberidaceae	*Berberis aquifolium**	Pursh	**SE2**	Tall Oregon-grape*			X	X
Berberidaceae	*Berberis thunbergii**	DC.	**SE5**	Japanese Barberry*	**3**		X	X
Ulmaceae	*Ulmus americana*	L.	**S5**	White Elm			X	X
Ulmaceae	*Ulmus pumila**	L.	**SE3**	Siberian Elm*	**2**		X	
Urticaceae	*Boehmeria cylindrica*	(L.) Sw.	**S5**	False Nettle			X	
Urticaceae	*Laportea canadensis*	(L.) Weddell	**S5**	Wood Nettle			X	X

Family	Scientific Name	Authority	S-Rank	Common Name	Inv.	1977	1983	2003
Urticaceae	*Pilea pumila*	(L.) Gray	S5	Dwarf Clearweed			X	
Urticaceae	*Urtica dioica*	L.	S5	Stinging Nettle			X	
Juglandaceae	*Carya cordiformis*	(Wangenh.) K. Koch	S5	Bitternut Hickory			X	X
Juglandaceae	*Carya ovata*	(P. Mill.) K. Koch	S5	Shagbark Hickory				X
Fagaceae	*Fagus grandifolia*	Ehrh.	S5	American Beech			X	X
Fagaceae	*Quercus macrocarpa*	Michx.	S5	Bur Oak			X	X
Fagaceae	*Quercus rubra*	L.	S5	Red Oak			X	X
Betulaceae	*Alnus incana*	(L.) Moench	S5	Speckled Alder			X	
Betulaceae	*Betula alleghaniensis*	Britt.	S5	Yellow Birch			X	
Betulaceae	*Betula papyrifera*	Marsh.	S5	White Birch			X	X
Betulaceae	*Betula pendula**	Roth	SE4	European Weeping Birch*	2		X	
Betulaceae	*Ostrya virginiana*	(P. Mill.) K. Koch	S5	Hop Hornbeam			X	
Chenopodiaceae	*Atriplex patula*	L.	S5	Halberd-leaf Saltbush			X	
Chenopodiaceae	*Chenopodium album**	L.	SE5	Lamb's Quarters*			X	X
Amaranthaceae	*Amaranthus powellii**	S. Wats.	SE5	Green Amaranth*			X	
Portulaceae	*Portulaca oleracea**	L.	SE5	Purslane*			X	
Caryophyllaceae	*Arenaria serpyllifolia**	L.	SE5	Thyme-leaf Sandwort*			X	
Caryophyllaceae	*Cerastium fontanum**	Baumg.	SE5	Common Mouse-ear Chickweed*		?	X	
Caryophyllaceae	*Dianthus armeria**	L.	SE5	Deptford Pink*			X	
Caryophyllaceae	*Saponaria officinalis**	L.	SE5	Bouncing-bet*	3			X
Caryophyllaceae	*Silene latifolia**	Poir.	SE5	Bladder Campion*		X	X	
Caryophyllaceae	*Silene vulgaris**	(Moench) Garcke	SE5	Catchfly*		?	X	X
Caryophyllaceae	*Stellaria graminea**	L.	SE5	Little Starwort*			X	
Caryophyllaceae	*Stellaria media**	(L.) Vill.	SE5	Common Stitchwort*			X	
Polygonaceae	*Polygonum achoreum*	Blake	S5	Leathery Knotweed			X	
Polygonaceae	*Polygonum aviculare**	L.	SE5	Prostrate Knotweed*			X	
Polygonaceae	*Polygonum convolvulus**	L.	SE5	Black Bindweed*			X	X
Polygonaceae	*Polygonum hydropiperoides*	Michx.	S5	Mild Water-pepper			X	
Polygonaceae	*Polygonum persicaria**	L.	SE5	Lady's-thumb*			X	
Polygonaceae	*Polygonum scandens*	L.	S4S5	Climbing False-buckwheat		X		
Polygonaceae	*Rumex acetosella**	L.	SE5	Sheep Sorrel*	4	X	X	
Polygonaceae	*Rumex obtusifolius**	L.	SE5	Bitter Dock*		?	X	X
Polygonaceae	*Rumex orbiculatus*	Gray	S4S5	Water Dock			X	
Clusiaceae	*Hypericum perforatum**	L.	SE5	Common St. John's-wort*	4	X	X	
Tiliaceae	*Tilia americana*	L.	S5	American Basswood			X	X
Tiliaceae	*Tilia coradata**	P. Mill.	SE1	Little-leaf Linden*	5		X	
Malvaceae	*Malva neglecta**	Wallr.	SE5	Dwarf Cheeseweed*			X	

Family	Scientific Name	Authority	S-Rank	Common Name	Inv.	1977	1983	2003
Violaceae	*Viola adunca*	Sm.	S4S5	Sand Violet			X	
Violaceae	*Viola affinis*	Le Conte	S4?	Le Conte's Violet			X	
Violaceae	*Viola conspersa*	Reichenb.	S5	American Bog Violet			X	
Violaceae	*Viola cucullata*	Ait.	S5	Marsh Blue Violet			X	
Violaceae	*Viola macloskeyi*	Lloyd	S5	Macloskey's Violet			X	
Violaceae	*Viola rostrata*	Pursh	S5	Long-spurred Violet			X	
Violaceae	*Viola sororia*	Willd.	S5	Woolly Blue Violet			X	
Salicaceae	*Populus balsamifera*	L.	S5	Balsam Poplar			X	
Salicaceae	*Populus grandidentata*	Michx.	S5	Large-tooth Aspen			X	X
Salicaceae	*Populus tremuloides*	Michx.	S5	Trembling Aspen			X	
Salicaceae	*Salix alba var. vitellina*	(L.) Stokes	SU	White Willow			X	
Salicaceae	*Salix bebbiana*	Sarg.	S5	Long-beaked Willow			X	X
Salicaceae	*Salix discolor*	Muhl.	S5	Pussy Willow			X	
Salicaceae	*Salix eriocephala*	Michx.	S5	Missouri Willow			X	
Salicaceae	*Salix fragilis**	L.	SE5	Crack Willow*	3		X	
Salicaceae	*Salix humilis*	Marsh.	S5	Prairie Willow			X	
Salicaceae	*Salix lucida*	Muhl.	S5	Shining Willow			X	
Salicaceae	*Salix petiolaris*	Sm.	S5	Slender Willow			X	
Brassicaceae	*Barbarea vulgaris**	Ait. f.	SE5	Yellow Rocket*	3		X	
Brassicaceae	*Capsella bursa-pastoris**	(L.) Medik.	SE5	Shepherd's Purse*			X	
Brassicaceae	*Cardamine diphylla*	(Michx.) Wood	S5	Two-leaved Toothwort			X	
Brassicaceae	*Cardamine pensylvanica*	Muhl. ex Willd.	S5	Pennsylvania Bitter-cress			X	
Brassicaceae	*Erysimum cheiranthoides**	L.	SE5	Wormseed Mustard*			X	
Brassicaceae	*Lepidium campestre**	(L.) Ait. f.	SE5	Field Pepper-grass*		?	X	
Brassicaceae	*Lepidium densiflorum**	Schrad.	SE5	Common Pepper-grass*			X	X
Brassicaceae	*Nasturtium officinale**	R. Br.	SE	True Water-cress*		?	X	
Brassicaceae	*Sinapis arvensis**	L.	SE5	Corn Mustard*			X	
Brassicaceae	*Sisymbrium altissimum**	L.	SE5	Tall Tumble-mustard*			X	
Brassicaceae	*Thlaspi arvense**	L.	SE5	Field Penny-cress*			X	
Ericaceae	*Gaultheria procumbens*	L.	S5	Wintergreen		X	X	
Pyrolaceae	*Chimaphila umbellata*	(L.) W. Bart.	S5	Common Pipsissewa			X	X
Pyrolaceae	*Pyrola asarifolia*	Michx.	S5	Pink Pyrola				X
Pyrolaceae	*Pyrola elliptica*	Nutt.	S5	Shinleaf		?	X	X
Monotropaceae	*Monotropa hypopithys*	L.	S4	Pinesap		X	X	X
Monotropaceae	*Monotropa uniflora*	Linnaeus	S5	Indian-pipe		X	X	X
Monotropaceae	*Pterospora andromedea*	Nutt.	S2	**Giant Pinedrops**		X		
Primulaceae	*Lysimachia ciliata*	L.	S5	Fringed Loosestrife				X
Primulaceae	*Trientalis borealis*	Raf.	S5	Star-flower		X	X	X
Grossulariaceae	*Ribes americanum*	P. Mill.	S5	Wild Black Currant			X	

Family	Scientific Name	Authority	S-Rank	Common Name	Inv.	1977	1983	2003
Grossulariaceae	*Ribes cynosbati*	L.	S5	Prickly Gooseberry			X	
Grossulariaceae	*Ribes triste*	Pallas	S5	Wild Red Currant			X	
Crassulaceae	*Sedum spurium**	Bieb.	SE1	Two-row Stonecrop*			X	
Saxifragaceae	*Mitella diphylla*	L.	S5	Two-leafed Bishop's-cap			X	X
Saxifragaceae	*Mitella nuda*	L.	S5	Naked Bishop's-cap			X	
Saxifragaceae	*Tiarella cordifolia*	L.	S5	False Mitrewort		X	X	X
Rosaceae	*Agrimonia gryposepala*	Wallr.	S5	Tall Hairy Agrimony		X	X	
Rosaceae	*Amelanchier laevis*	Wieg.	S5	Allegheny Serviceberry			X	
Rosaceae	*Amelanchier sanguinea*	(Pursh) DC.	S5?	Roundleaf Juneberry			X	
Rosaceae	*Crataegus sp.*	L.	n/a	Hawthorn				X
Rosaceae	*Crataegus monogyna**	Jacq.	SE5	English Hawthorn*	3		X	
Rosaceae	*Fragaria vesca*	L.	S5	Woodland Strawberry		X	X	
Rosaceae	*Fragaria virginiana*	Duchesne	S5	Virginia Strawberry		X	X	
Rosaceae	*Geum aleppicum*	Jacq.	S5	Yellow Avens		X	X	X
Rosaceae	*Geum canadense*	Jacq.	S5	White Avens			X	
Rosaceae	*Geum rivale*	L.	S5	Purple Avens			X	
Rosaceae	*Potentilla argentea**	L.	SE5	Silvery Cinquefoil*			X	
Rosaceae	*Potentilla norvegica*	L.	S5	Norwegian Cinquefoil		?	X	X
Rosaceae	*Potentilla recta**	L.	SE5	Sulphur Cinquefoil*			X	X
Rosaceae	*Prunus pensylvanica*	L. f.	S5	Pin Cherry			X	
Rosaceae	*Prunus serotina*	Ehrh.	S5	Black Cherry			X	
Rosaceae	*Prunus virginiana*	L.	S5	Choke Cherry			X	X
Rosaceae	*Rosa blanda*	Ait.	S5	Smooth Rose			X	
Rosaceae	*Rosa multiflora**	Thunb. ex Murr.	SE4	Multiflora Rose*	1		X	
Rosaceae	*Rubus allegheniensis*	Porter	S5	Allegheny Blackberry			X	
Rosaceae	*Rubus idaeus ssp. melanolasius*	(Dieck) Focke	S5	Wild Red Raspberry			X	
Rosaceae	*Rubus occidentalis*	L.	S5	Black Raspberry			X	
Rosaceae	*Rubus pubescens*	Raf.	S5	Dwarf Raspberry			X	
Rosaceae	*Sanguisorba minor**	Scop.	SE4	Salad Burnet*			X	
Rosaceae	*Sorbus aucuparia**	L.	SE4	European Mountain-ash*	4		X	
Fabaceae	*Caragana arborescens**	Lam.	SE1	Siberian Peashrub*			X	X
Fabaceae	*Medicago lupulina**	L.	SE5	Black Medic*	4		X	X
Fabaceae	*Medicago sativa ssp. sativa**		SE5	Purple Alfalfa*	4			X
Fabaceae	*Melilotus alba**		SE5	White Sweet-clover*	2	X	X	X
Fabaceae	*Melilotus officinalis**	(L.) Lam.	SE5	Yellow Sweet-clover*	2		X	
Fabaceae	*Robinia pseudo-acacia**		SE5	Black Locust*	2			X
Fabaceae	*Trifolium aureum**	Pollich	SE5	Yellow Clover*		X		
Fabaceae	*Trifolium pratense**	L.	SE5	Red Clover*	4		X	

Family	Scientific Name	Authority	S-Rank	Common Name	Inv.	1977	1983	2003
Fabaceae	*Trifolium repens**	L.	SE5	White Clover*	4	X	X	X
Fabaceae	*Vicia cracca**	L.	SE5	Tufted Vetch*	2		X	
Elaeagnaceae	*Elaeagnus commutata*	Bernh. ex Rydb.	S5	American Silverberry			X	
Onagraceae	*Circaea alpina*	L.	S5	Smaller Enchanter's Nightshade		X	X	X
Onagraceae	*Circaea lutetiana*	L.	S5	Yellowish Enchanter's Nightshade			X	X
Onagraceae	*Epilobium angustifolium*	L.	S5	Fireweed			X	
Onagraceae	*Epilobium ciliatum*	Raf.	S5	Hairy Willow-herb			X	
Onagraceae	*Epilobium coloratum*	Biehler	S5	Purple-veined Willow-herb			X	
Onagraceae	*Epilobium parviflorum**	Schreb.	SE4	Small-flower Willow-herb*			X	
Onagraceae	*Oenothera biennis*	L.	S5	Common Evening-primrose		X		
Onagraceae	*Oenothera parviflora*	L.	S4?	Small-flowered Evening-primrose			X	
Onagraceae	*Oenothera pilosella*	Raf.	S2	Finely-pilose Evening-primrose			X	
Cornaceae	*Cornus alternifolia*	L. f.	S5	Alternate-leaved Dogwood			X	
Cornaceae	*Cornus canadensis*	L.	S5	Bunchberry		X	X	
Cornaceae	*Cornus rugosa*	Lam.	S5	Round-leaved Dogwood			X	
Cornaceae	*Cornus stolonifera*	Michx.	S5	Red-osier Dogwood			X	X
Celastraceae	*Celastrus scandens*	L.	S5	Climbing Bittersweet			X	
Euphorbiaceae	*Chamaesyce glyptosperma**	(Engelm.) Small	SE5	Ring-seeded Spurge*			X	
Euphorbiaceae	*Chamaesyce maculata**	(L.) Small	SE5	Spotted Spurge*			X	
Rhamnaceae	*Rhamnus alnifolia*	L'Her.	S5	Alder-leaved Buckthorn			X	
Vitaceae	*Parthenocissus vitacea*	(Knerr) A. Hitchc.	S5	Inserted Virginia-creeper			X	X
Vitaceae	*Vitis riparia*	Michx.	S5	Riverbank Grape			X	X
Polygalaceae	*Polygala paucifolia*	Willd.	S5	Gay-wing Milkwort			X	
Aceraceae	*Acer platanoides**	L.	SE5	Norway Maple*	2		X	
Aceraceae	*Acer rubrum*	L.	S5	Red Maple			X	X
Aceraceae	*Acer saccharum ssp. saccharum*	Marsh.	S5	Sugar Maple			X	X
Aceraceae	*Acer spicatum*	Lam.	S5	Mountain Maple			X	
Anacardiaceae	*Rhus radicans ssp. rydbergii*	(Small ex Rydb.) McNeill	S5	Western Poison-ivy			X	X
Anacardiaceae	*Rhus typhina*	L.	S5	Staghorn Sumac			X	X
Oxalidaceae	*Oxalis acetosella*	L.	S5	True Wood-sorrel		?	X	
Oxalidaceae	*Oxalis stricta*	L.	S5	Upright Yellow Wood-sorrel		X	X	X
Geraniaceae	*Geranium robertianum**	L.	SE5	Herb-robert*		X	X	X
Balsaminaceae	*Impatiens capensis*	Meerb.	S5	Spotted Jewel-weed		X	X	X
Araliaceae	*Aralia nudicaulis*	L.	S5	Wild Sarsaparilla		X	X	X
Araliaceae	*Aralia racemosa*	L.	S5	Spikenard			X	X

Family	Scientific Name	Authority	S-Rank	Common Name	Inv.	1977	1983	2003
Apiaceae	*Aegopodium podagraria**	L.	SE5	Goutweed*	1		X	
Apiaceae	*Cryptotaenia canadensis*	(L.) DC.	S5	Honewort			X	
Apiaceae	*Daucus carota**	L.	SE5	Wild Carrot*			X	X
Apiaceae	*Hydrocotyle americana*	L.	S5	American Marsh-pennywort			X	
Apiaceae	*Osmorhiza claytonii*	(Michx.) C.B. Clarke	S5	Woolly Sweet-cicely			X	
Apiaceae	*Sanicula marilandica*	L.	S5	Black Snakeroot			X	
Apocynaceae	*Apocynum androsaemifolium*	L.	S5	Spreading Dogbane		X	X	X
Apocynaceae	*Vinca minor**	L.	SE5	Periwinkle*	2		X	X
Asclepiadaceae	*Asclepias incarnata*	L.	S5	Swamp Milkweed			X	
Asclepiadaceae	*Asclepias syriaca*	L.	S5	Common Milkweed		X	X	
Solanaceae	*Physalis heterophylla*	Nees	S4	Clammy Ground-cherry			X	
Solanaceae	*Solanum dulcamara**	L.	SE5	Bitter Nightshade*	3	?	X	X
Solanaceae	*Solanum ptychanthum*	Dunal	S5	Eastern Black Nightshade			X	
Convolvulaceae	*Calystegia spithamaea*	(L.) Pursh	S4S5	Low Bindweed			X	
Boraginaceae	*Cynoglossum officinale**	L.	SE5	Hound's-tongue*			X	
Boraginaceae	*Echium vulgare**	L.	SE5	Blueweed*		X	X	X
Boraginaceae	*Myosotis scorpioides**	L.	SE5	True Forget-me-not*	4	?	X	
Phrymaceae	*Phryma leptostachya*	L.	S4S5	Lopseed			X	
Verbenaceae	*Verbena hastata*	L.	S5	Blue Vervain			X	
Lamiaceae	*Ajuga reptans**	L.	SE2	Creeping Bugleweed*	4		X	
Lamiaceae	*Clinopodium vulgare*	L.	S5	Wild Basil			X	X
Lamiaceae	*Leonurus cardiaca**	L.	SE5	Common Motherwort*			X	
Lamiaceae	*Lycopus americanus*	Muhl. ex W. Bart.	S5	American Bugleweed			X	
Lamiaceae	*Lycopus uniflorus*	Michx.	S5	Northern Bugleweed		?	X	
Lamiaceae	*Mentha arvensis*	L.	S5	American Wild Mint			X	
Lamiaceae	*Monarda fistulosa*	L.	S5	Wild Bergamot			X	X
Lamiaceae	*Nepeta cataria**	L.	SE5	Catnip*	4		X	
Lamiaceae	*Prunella vulgaris ssp. lanceolata*	(W. Bart.) Hulten	S5	Heal-all		X	X	X
Lamiaceae	*Pycnanthemum virginianum*	(L.) T. Dur. & B.D. Jackson ex B.L. Robins. & Fern	S4	Virginia Mountain-mint			X	
Lamiaceae	*Scutellaria galericulata*	L.	S5	Hooded Skullcap			X	
Lamiaceae	*Scutellaria lateriflora*	L.	S5	Mad-dog Skullcap				X
Plantaginaceae	*Plantago lanceolata**	L.	SE5	English Plantain*		X	X	X
Plantaginaceae	*Plantago major**	L.	SE5	Common Plantain*		X	X	X
Plantaginaceae	*Plantago rugelii*	Dcne.	S5	Rugel's Plantain			X	X
Oleaceae	*Fraxinus americana*	L.	S5	White Ash			X	X

Family	Scientific Name	Authority	S-Rank	Common Name	Inv	1977	1983	2003
Oleaceae	*Fraxinus nigra*	Marsh.	S5	Black Ash			X	
Oleaceae	*Fraxinus pennsylvanica*	Marsh.	S5	Red Ash			X	
Oleaceae	*Syringa vulgaris**	L.	SE5	Common Lilac*	2		X	
Scrophulariaceae	*Chaenorrhinum minus**	(L.) Lange	SE5	Dwarf Snapdragon*			X	
Scrophulariaceae	*Chelone glabra*	L.	S5	Turtlehead			X	
Scrophulariaceae	*Linaria vulgaris**	P. Mill.	SE5	Butter-and-eggs*	4		X	
Scrophulariaceae	*Melampyrum lineare*	Desr.	S4S5	Cow-wheat			X	
Scrophulariaceae	*Mimulus ringens*	L.	S5	Square-stemmed Monkey-flower			X	
Scrophulariaceae	*Verbascum thapsus**	L.	SE5	Common Mullein*		X	X	
Scrophulariaceae	*Veronica agrestis**	L.	SE1?	Field Speedwell*			X	
Scrophulariaceae	*Veronica anagallis-aquatica**	L.	SE5	Water Speedwell*			X	
Scrophulariaceae	*Veronica officinalis**	L.	SE5	Common Speedwell*		?	X	
Scrophulariaceae	*Veronica scutellata*	L.	S5	Marsh Speedwell			X	
Scrophulariaceae	*Veronica serpyllifolia*	L.	S5	Thyme-leaved Speedwell				X
Campanulaceae	*Lobelia inflata*	L.	S5	Indian-tobacco			X	X
Campanulaceae	*Lobelia siphilitica*	L.	S5	Great Lobelia			X	X
Rubiaceae	*Galium asprellum*	Michx.	S5	Rough Bedstraw		?	X	
Rubiaceae	*Galium obtusum*	Bigelow	S4S5	Blunt-leaved Bedstraw			X	
Rubiaceae	*Galium triflorum*	Michx.	S5	Sweet-scented Bedstraw			X	X
Rubiaceae	*Hedyotis longifolia*	(Gaertn.) Hook.	S4?	Long-leaved Bluets		X	X	
Rubiaceae	*Mitchella repens*	L.	S5	Partridge-berry		X		X
Caprifoliaceae	*Diervilla lonicera*	P. Mill.	S5	Northern Bush-honeysuckle		X	X	X
Caprifoliaceae	*Linnaea borealis*	L.	S5	Twinflower			X	
Caprifoliaceae	*Lonicera canadensis*	Bartr. ex Marsh.	S5	American Fly Honeysuckle			X	
Caprifoliaceae	*Lonicera dioica*	L.	S5	Glaucous Honeysuckle			X	
Caprifoliaceae	*Lonicera hirsuta*	Eat.	S5	Hairy Honeysuckle			X	
Caprifoliaceae	*Lonicera tartarica**	L.	SE5	Tartarian Honeysuckle*	1		X	X
Caprifoliaceae	*Sambucus canadensis*	L.	S5	Common Elderberry			X	
Caprifoliaceae	*Sambucus racemosa ssp. pubens*	(Michx.) House	S5	Red Elderberry			X	X
Caprifoliaceae	*Symphoricarpos albus var. laevigatus**	(Fern.) Blake	SE1	Snowberry*	4		X	
Caprifoliaceae	*Viburnum acerifolium*	L.	S5	Maple-leaved Viburnum			X	X
Caprifoliaceae	*Viburnum lantana**	L.	SE2	Wayfaring-tree*			X	
Caprifoliaceae	*Viburnum lantanoides*	Michx.	S5	Hobblebush			X	
Caprifoliaceae	*Viburnum lentago*	L.	S5	Nannyberry			X	
Caprifoliaceae	*Viburnum opulus**	L.	SE4	Guelder-rose Viburnum*	4			X
Caprifoliaceae	*Viburnum trilobum*		S5	Highbush Cranberry			X	

Family	Scientific Name	Authority	S-Rank	Common Name	Inv.	1977	1983	2003
Asteraceae	*Achillea millefolium ssp. lanulosa*	(Nutt.) Piper	S5	Woolly Yarrow		X	X	X
Asteraceae	*Ambrosia artemisiifolia*	L.	S5	Annual Ragweed		X	X	X
Asteraceae	*Anaphalis margaritacea*	(L.) Benth. & Hook. f.	S5	Pearly Everlasting			X	
Asteraceae	*Antennaria neglecta*	Greene	S5	Field Pussytoes			X	
Asteraceae	*Arctium minus**	Bernh.	SE5	Lesser Burdock*			X	X
Asteraceae	*Artemisia biennis**	Willd.	SE5	Biennial Wormwood*			X	
Asteraceae	*Artemisia vulgaris**	L.	SE5	Common Mugwort*	5			X
Asteraceae	*Bidens cernua*	L.	S5	Nodding Beggar-ticks			X	
Asteraceae	*Bidens frondosa*	L.	S5	Devil's Beggar-ticks			X	
Asteraceae	*Chrysanthemum leucanthemum**	L.	SE5	Ox-eye Daisy*		X	X	X
Asteraceae	*Cichorium intybus**	L.	SE5	Chicory*			X	
Asteraceae	*Cirsium arvense**	(L.) Scop.	SE5	Canada Thistle*	1	?	X	
Asteraceae	*Cirsium muticum*	Michx.	S5	Swamp Thistle			X	
Asteraceae	*Cirsium vulgare**	(Savi) Ten.	SE5	Bull Thistle*			X	
Asteraceae	*Conyza canadensis*	(L.) Cronq.	S5	Horseweed			X	X
Asteraceae	*Crepis tectorum**	L.	SE5	Narrow-leaved Hawk's Beard*			X	X
Asteraceae	*Doellingeria umbellata var. umbellata*	(P. Mill.) Nees	S5	Flat-top White Aster			X	
Asteraceae	*Erechtites hieracifolia*	(L.) Raf. ex DC.	S5	Fire-weed			X	
Asteraceae	*Erigeron annuus*	(L.) Pers.	S5	Daisy Fleabane			X	X
Asteraceae	*Erigeron philadelphicus ssp. philadelphicus*	L.	S5	Philadelphia Fleabane			X	
Asteraceae	*Erigeron strigosus*	Muhl. ex Willd.	S5	Daisy Fleabane		?	X	
Asteraceae	*Eupatorium maculatum ssp. maculatum*	L.	S5	Spotted Joe-pye Weed		X	X	
Asteraceae	*Eupatorium perfoliatum*	L.	S5	Perfoliate Thoroughwort			X	
Asteraceae	*Eupatorium rugosum*	Houtt.	S5	White Snakeroot				X
Asteraceae	*Eurybia macrophylla*	(L.) Cass.	S5	Large-leaf Wood-aster		X	X	
Asteraceae	*Euthamia graminifolia*	(L.) Nutt.	S5	Flat-topped Bushy Goldenrod			X	
Asteraceae	*Galinsoga quadriradiata**	Ruiz & Pavon	SE5	Hairy Galinsoga*			X	
Asteraceae	*Helianthus pauciflorus ssp. subrhomboideus*	(Rydb.) O. Spring & E. Schilling	S4?	Prairie Sunflower			?	
Asteraceae	*Heliopsis helianthoides*	(L.) Sweet	S5	Ox-eye				X
Asteraceae	*Hieracium aurantiacum**	L.	SE5	Orange Hawkweed*	3	X	X	
Asteraceae	*Hieracium caespitosum**	Dumort.	SE5	Field Hawkweed*	3	?	X	
Asteraceae	*Hieracium canadense*	Michx.	SU	Canada Hawkweed			X	

Family	Scientific Name	Authority	S-Rank	Common Name	Inv.	1977	1983	2003
Asteraceae	*Hieracium pilosella**	L.	SE5	Mouse-ear Hawkweed*		?	X	
Asteraceae	*Lactuca biennis*	(Moench) Fern.	S5	Biennial Lettuce				X
Asteraceae	*Lactuca canadensis*	L.	S5	Canada Lettuce			X	
Asteraceae	*Lactuca serriola**	L.	SE5	Prickly Lettuce*			X	
Asteraceae	*Prenanthes altissima*	L.	S5	Tall White Rattlesnake-root			X	
Asteraceae	*Rudbeckia hirta*	L.	S5	Black-eyed Susan		X	X	
Asteraceae	*Rudbeckia laciniata*	L.	S5	Cut-leaved Coneflower			X	
Asteraceae	*Senecio vulgaris**	L.	SE5	Common Groundsel*		?	X	
Asteraceae	*Solidago altissima*	L.	S5	Tall Goldenrod			X	
Asteraceae	*Solidago caesia*	L.	S5	Blue-stem Goldenrod			X	
Asteraceae	*Solidago canadensis var. canadensis*	L.	S5	Canada Goldenrod		X	X	X
Asteraceae	*Solidago gigantea*	Ait.	S5	Giant Goldenrod			X	
Asteraceae	*Solidago hispida*	Muhl. ex Willd.	S5	Hairy Goldenrod			X	
Asteraceae	*Solidago nemoralis ssp. nemoralis*	Ait.	S5	Gray Goldenrod			X	
Asteraceae	*Solidago rugosa*	P. Mill.	S5	Rough Goldenrod			X	
Asteraceae	*Sonchus arvensis ssp. arvensis**	L.	SE5	Field Sow-thistle*			X	
Asteraceae	*Sonchus oleraceus**	L.	SE5	Common Sow-thistle*			X	
Asteraceae	*Symphyotrichum cordifolium*	(L.) Nesom	S5	Heart-leaved Aster			X	X
Asteraceae	*Symphyotrichum lanceolatum ssp. lanceolatum*	(Willd.) Nesom	S5	Tall White Aster			X	
Asteraceae	*Symphyotrichum lateriflorum*	(L.) A. & D. Love	S5	Starved Aster			X	
Asteraceae	*Symphyotrichum oolentangiense*	(Riddell) Nesom	S4	Sky-blue Aster			X	
Asteraceae	*Symphyotrichum puniceum*	(L.) A. & D. Love	S5	Purple-stemmed Aster			X	
Asteraceae	*Symphyotrichum urophyllum*	(Lindl.) Nesom	S4	Arrow-leaved Aster				X
Asteraceae	*Tanacetum parthenium**	(L.) Schultz-Bip.	SE3	Feather-leaf Tansy*			X	
Asteraceae	*Taraxacum officinale**	G.H. Weber ex Wiggers	SE5	Common Dandelion*		X	X	
Asteraceae	*Tragopogon dubius**	Scop.	SE5	Doubtful Goat's-beard*			X	
Asteraceae	*Tragopogon pratensis**	L.	SE5	Meadow Goat's-beard*		?	X	
Asteraceae	*Tussilago farfara**	L.	SE5	Coltsfoot*	4		X	X
Alismataceae	*Alisma subcordatum*	Raf.	SU	Southern Water-plantain			X	
Alismataceae	*Sagittaria latifolia*	Willd.	S5	Broad-leaved Arrowhead		X	X	
Araceae	*Arisaema triphyllum*	(L.) Schott	S5	Jack-in-the-pulpit		X	X	X
Lemnaceae	*Lemna minor*	L.	S5	Lesser Duckweed			X	
Juncaceae	*Juncus articulatus*	L.	S5	Jointed Rush			X	

Family	Scientific Name	Authority	S-Rank	Common Name	Inv.	1977	1983	2003
Juncaceae	*Juncus dudleyi*	Wieg.	S5	Dudley's Rush			X	
Juncaceae	*Juncus effusus*	L.	S5	Soft Rush			X	
Juncaceae	*Juncus tenuis*	Willd.	S5	Path Rush			X	
Cyperaceae	*Carex arctata*	Boott ex Hook.	S5	Black Sedge			X	
Cyperaceae	*Carex backii*	Boott	S4S5	Back's Sedge			X	
Cyperaceae	*Carex bebbii*	Olney ex Fern.	S5	Bebb's Sedge			X	
Cyperaceae	*Carex blanda*	Dewey	S5	Woodland Sedge			X	
Cyperaceae	*Carex communis*	Bailey	S5	Fibrous-root Sedge			X	
Cyperaceae	*Carex crinita*	Lam.	S5	Fringed Sedge			X	
Cyperaceae	*Carex cristatella*	Britt.	S5	Crested Sedge			X	
Cyperaceae	*Carex deweyana*	Schwein.	S5	Short-scale Sedge			X	X
Cyperaceae	*Carex disperma*	Dewey	S5	Soft-leaved Sedge			X	
Cyperaceae	*Carex flava*	L.	S5	Yellow Sedge			X	
Cyperaceae	*Carex foenea*	Willd.	S5	Bronzy Sedge			X	
Cyperaceae	*Carex gracillima*	Schwein.	S5	Graceful Sedge			X	
Cyperaceae	*Carex hystericina*	Muhl. ex Willd.	S5	Porcupine Sedge			X	
Cyperaceae	*Carex interior*	Bailey	S5	Inland Sedge			X	
Cyperaceae	*Carex intumescens*	Rudge	S5	Bladder Sedge			X	
Cyperaceae	*Carex leptalea*	Wahlenb.	S5	Bristle-stalked Sedge			X	
Cyperaceae	*Carex leptonervia*	(Fern.) Fern.	S4	Finely-nerved Sedge			X	
Cyperaceae	*Carex lupulina*	Muhl. ex Willd.	S5	Hop Sedge			X	X
Cyperaceae	*Carex merritt-fernaldi*	Mackenzie	S5	Merritt Fernald's Sedge			X	X
Cyperaceae	*Carex muehlenbergii*	Schkuhr ex Willd.	S4S5	Muhlenberg's Sedge			X	
Cyperaceae	*Carex peckii*	Howe	S5	White-tinged Sedge			X	
Cyperaceae	*Carex pensylvanica*	Lam.	S5	Pennsylvania Sedge			X	
Cyperaceae	*Carex plantaginea*	Lam.	S5	Plantain-leaved Sedge			X	
Cyperaceae	*Carex radiata*	(Wahlenb.) Small	S4	Radiate Sedge			X	
Cyperaceae	*Carex retrorsa*	Schwein.	S5	Retrorse Sedge			X	
Cyperaceae	*Carex rosea*	Schkuhr ex Willd.	S5	Rosy Sedge			X	
Cyperaceae	*Carex scabrata*	Schwein.	S5	Rough Sedge			X	X
Cyperaceae	*Carex scoparia*	Schkuhr ex Willd.	S5	Pointed Broom Sedge			X	
Cyperaceae	*Carex siccata*	Dewey	S5	Dry-spike Sedge				X
Cyperaceae	*Carex spicata**		SE5	Spiked Sedge*			X	
Cyperaceae	*Carex stipata*	Muhl. ex Willd.	S5	Awl-fruited Sedge				X
Cyperaceae	*Carex tonsa var. rugosperma*	(Mackenzie) Crins	S5	Red-seeded Sedge			X	
Cyperaceae	*Carex trisperma var. trisperma*		S5	Three-seeded Sedge			X	
Cyperaceae	*Carex vulpinoidea*	Michx.	S5	Fox Sedge			X	
Cyperaceae	*Cyperus houghtonii*	Torr.	S3?	Houghton's Umbrella-sedge			X	
Cyperaceae	*Eleocharis erythropoda*	Steud.	S5	Bald Spike-rush			X	

Cyperaceae	*Scirpus atrovirens*	Willd.	**S5**	Dark-green Bulrush			X	X
Cyperaceae	*Scirpus cyperinus*	(L.) Kunth	**S5**	Cottongrass Bulrush			X	
Poaceae	*Agrostis gigantea**	Roth	**SE5**	Black Bentgrass*			X	
Poaceae	*Agrostis stolonifera*	L.	**S5**	Spreading Bentgrass			X	
Poaceae	*Avena sativa**	L.	**SE3**	Cultivated Oat*				X
Poaceae	*Brachyelytrum erectum*	(Schreb. ex Spreng.) Beauv.	**S4S5**	Bearded Shorthusk			X	X
Poaceae	*Bromus ciliatus*	L.	**S5**	Fringed Brome			X	
Poaceae	*Bromus inermis ssp. inermis**		**SE5**	Awnless Brome*	**3**		X	X
Poaceae	*Bromus tectorum**	L.	**SE5**	Cheat Grass*			X	
Poaceae	*Calamagrostis canadensis*	(Michx.) Beauv.	**S5**	Canada Blue-joint			X	
Poaceae	*Dactylis glomerata**	L.	**SE5**	Orchard Grass*	**3**		X	X
Poaceae	*Danthonia spicata*	(L.) Beauv. ex Roemer & J.A. Schultes	**S5**	Poverty Oatgrass			X	X
Poaceae	*Digitaria sanguinalis**	(L.) Scop.	**SE5**	Large Crabgrass*			X	
Poaceae	*Echinochloa crusgalli**	(L.) Beauv.	**SE5**	Barnyard Grass*			X	
Poaceae	*Elymus repens**	(L.) Gould	**SE5**	Creeping Wild-rye*	**3**		X	X
Poaceae	*Eragrostis minor**	Host	**SE5**	Low Lovegrass*			X	
Poaceae	*Festuca pratensis**	Huds.	**SE5**	Meadow Fescue*			X	
Poaceae	*Festuca rubra*	L.	**S5**	Red Fescue			X	
Poaceae	*Festuca trachyphylla**	(Hackel) Krajina	**SE4**	Hard Fescue*			X	
Poaceae	*Glyceria grandis*	S. Wats.	**S4S5**	Tall Mannagrass			X	
Poaceae	*Glyceria striata*	(Lam.) A.S. Hitchc.	**S5**	Fowl Mannagrass			X	X
Poaceae	*Leersia oryzoides*	(L.) Sw.	**S5**	Rice Cutgrass			X	
Poaceae	*Lolium perenne**	L.	**SE4**	English Ryegrass*			X	
Poaceae	*Muhlenbergia mexicana*	(L.) Trin.	**S5**	Mexican Muhly			X	
Poaceae	*Oryzopsis asperifolia*	Michx.	**S5**	White-grained Mountain-rice			X	
Poaceae	*Oryzopsis pungens*	(Torr. ex Spreng.) A.S. Hitchc.	**S5**	Slender Mountain-rice			X	
Poaceae	*Panicum acuminatum*	Sw.	**S5**	Panic Grass			X	X
Poaceae	*Panicum capillare*	L.	**S5**	Old Witch Panic Grass			X	
Poaceae	*Panicum latifolium*	L.	**S4**	Broad-leaved Panic Grass			X	
Poaceae	*Panicum linearifolium*	Scribner	**S4S5**	Narrow-leaved Panic Grass			X	
Poaceae	*Phalaris arundinacea*	L.	**S5**	Reed Canary Grass	**5**		X	
Poaceae	*Phleum pratense**	L.	**SE5**	Timothy*			X	
Poaceae	*Poa annua**	L.	**SE5**	Annual Bluegrass*			X	
Poaceae	*Poa compressa**	L.	**SE5**	Canada Bluegrass*			X	

Family	Scientific Name	Authority	S-Rank	Common Name	Inv.	1977	1983	2003
Poaceae	*Poa palustris*	L.	S5	Fowl Bluegrass			X	
Poaceae	*Poa pratensis ssp. pratensis*		S5	Kentucky Bluegrass	2		X	X
Poaceae	*Poa saltuensis*	Fern. & Wieg.	S4	Drooping Bluegrass			X	
Poaceae	*Schizachne purpurascens*	(Torr.) Swallen	S5	False Melic Grass			X	
Poaceae	*Secale cereale**	L.	SE3	Cultivated Rye*				X
Poaceae	*Setaria pumila**	(Poir.) Roemer & J.A. Schultes	SE5	Yellow Foxtail*	4		X	X
Poaceae	*Setaria viridis**	(L.) Beauv.	SE5	Green Foxtail*	4		X	
Poaceae	*Sphenopholis intermedia*	(Rydb.) Rydb.	S4S5	Slender Wedgegrass			X	
Poaceae	*Sporobolus cryptandrus*	(Torr.) Gray	S4	Sand Dropseed				X
Poaceae	*Triticum aestivum**	L.	SE1	Cultivated Wheat*			X	
Typhaceae	*Typha latifolia*	L.	S5	Broad-leaved Cattail		X	X	
Liliaceae	*Asparagus officinalis**	L.	SE5	Garden Asparagus*				X
Liliaceae	*Clintonia borealis*	(Ait.) Raf.	S5	Bluebead-lily		X	X	X
Liliaceae	*Lilium philadelphicum*	L.	S5	Wood Lily		X		
Liliaceae	*Maianthemum canadense*	Desf.	S5	Wild Lily-of-the-valley		X	X	
Liliaceae	*Maianthemum racemosum*	(L.) Link	S5	False Solomon's Seal		X	X	X
Liliaceae	*Maianthemum stellatum*	(L.) Link	S5	Star-flowered Solomon's Seal			X	
Liliaceae	*Maianthemum trifolium*	(L.) Sloboda	S5	Three-leaved Solomon's Seal		X		
Liliaceae	*Medeola virginiana*	L.	S5	Indian Cucumber-root			X	
Liliaceae	*Polygonatum pubescens*	(Willd.) Pursh	S5	Downy Solomon's-seal		?	X	X
Liliaceae	*Smilax herbacea*	L.	S4	Smooth Herbaceous Greenbrier			X	
Liliaceae	*Streptopus lanceolatus*	Michx.	S5	Rose Twisted-stalk		X	X	
Liliaceae	*Trillium erectum*	L.	S5	Purple Trillium			X	
Liliaceae	*Trillium grandiflorum*	(Michx.) Salisb.	S5	White Trillium		X	X	X
Liliaceae	*Trillium undulatum*	Willd.	S5?	Painted Trillium			X	
Iridaceae	*Iris versicolor*	L.	S5	Blueflag			X	
Orchidaceae	*Corallorhiza maculata*	(Raf.) Raf.	S5	Spotted Coral-root			X	
Orchidaceae	*Cypripedium acaule*	Ait.	S5	Pink Lady's-slipper		?	X	
Orchidaceae	*Cypripedium calceolus*	L.	S4S5	Yellow Lady's-slipper			X	
Orchidaceae	*Cypripedium reginae*	Walt.	S4	Showy Lady's-slipper			X	
Orchidaceae	*Epipactis helleborine**	(L.) Crantz	SE5	Common Helleborine*		X	X	X
Orchidaceae	*Goodyera repens*	(L.) R. Br. ex Ait. f.	S5	Dwarf Rattlesnake-plantain			X	
Orchidaceae	*Platanthera aquilonis*	Sheviak	S5	Leafy Northern Green Orchid		?		
Orchidaceae	*Spiranthes romanzoffiana*	Cham.	S5	Hooded Ladies'-tresses		?		
				Totals =>	**46**	**84**	**428**	**148**

51988
(5k P.R., 05 11 15)
ISBN 0-7794-9194-7 (Print)

Printed on recycled paper